INDIA RUBBER WORLD

JULY, 1943

A BILL BROTHERS PUBLICATION

Newsletter No. 7
JULY, 1943

Published by Rubber Chemicals Division of DU PONT

Safe Processing Fast Curing Neoprene Type GN Stocks Containing Acetate and Permalux

MUCH concern is expressed over the possibility of an equipment shortage developing due to the greater time required for processing and curing synthetic rubber products. That phase of the problem involving a possible shortage of curing equipment can be happily solved in neoprene stocks by the use of the retarder-activator combination of sodium acetate and PERMALUX. You have recognized for some time the fact that various phenolic bodies, such as catechol and PERMALUX (the DOTG salt of dicatechol borate), are very effective accelerators for neoprene compounds. However, the usefulness of these organic accelerators has been materially restricted due to the fact that for most purposes they destabilize the stock to such an extent that it cannot be safely processed.

SODIUM ACETATE has been found to be an effective retarder at processing temperatures for Neoprene Type GN stocks cured with magnesia and zinc oxide. Even when these stocks are activated with Permalux, the processing safety of the compounds produced is better than a normal neoprene stock containing neither the retarder nor the activator. Sodium acetate is not effective in stocks cured with litharge alone or with litharge in combination with zinc oxide or magnesia.

The outstanding value of using the retarder-accelerator combination (sodium acetate and PERMALUX) in a Neoprene Type GN stock is illustrated by the data in the accompanying table. It should be particularly noted that Stock No. 19 containing the sodium acetate and PERMALUX is slightly safer processing than the control Stock No. 17 as measured by the 60-minute at 227° F. cure. However, at the normal curing temperature of 287° F. (40 pounds per square inch steam) the optimum cure on the control Stock No. 17 was 30 minutes whereas Stock No. 19 containing sodium acetate and PERMALUX was completely cured in 15 minutes. The tensile strength, hardness and tear strength of both stocks are comparable. A further indication of the faster rate of cure obtained by the sodium acetate-PERMALUX combination can be seen from a measure of the resilience.

MAXIMUM PROCESSING SAFETY—In many manufacturing processes it is impossible to avoid reprocessing of stocks. In such cases difficulty has sometimes been experienced due to the insufficient stability of the normal Neoprene Type GN stocks. In these cases considerable advantage can be gained by the use of sodium acetate alone as a retarder of vulcanization during the processing stage. At curing temperatures, the sodium acetate is a mild activator of vulcanization. In this respect sodium acetate in Neoprene Type GN reacts in much the same manner as RETARDER W in rubber.

Sodium acetate is available in both flake and granular form. *It is most important that only the Granular 60 per cent Sodium Acetate be used because it disperses much more readily than does the flake form.*

Effect of Sodium Acetate and Permalux in a Moderately Loaded Neoprene Stock Containing 30 Parts Channel Black

Stock	17	19
Neoprene Type GN	100.0	100.0
NEOZONE A	2.0	2.0
Stearic Acid	2.0	2.0
Extra Light Calcined Magnesia	4.0	4.0
Channel Carbon Black	30.0	30.0
Process Oil	3.0	3.0
Sodium Acetate .$3H_2O$	—	1.0
PERMALUX	—	1.0
Zinc Oxide	5.0	5.0
Original Plasticity-Recovery 80°C.—Williams' Plastometer	110-6	115-15
Processing Stability (Cure 60 min. at 227°F.)		
Stress at 600% Elongation—psi.	125	50
Tensile Strength at Break—psi.	550	325
Elongation at Break—%	1045	1060
Hardness—Shore "A"	40	37
Vulcanized Properties		
Optimum Cure at 287°F. (40 psi.) min.	30	15
Stress at 500% Elongation—psi.	2000	1800
Tensile Strength at Break—psi.	3450	3200
Elongation at Break—%	820	840
Hardness—Shore "A"	60	62
Tear Strength—lbs. per inch	410	400
Heat Build-Up*—Goodrich Flexometer 1/8" Stroke for 20 min.—°C.	42	30

*Press Cure—120 min. at 287° F.—operated at 1800 cycles per minute with load of 153.3 lbs. per square inch on pellets 0.75" diameter x 1.0" high.

Through the mill

GRANULAR 60% SODIUM ACETATE—Inquiries regarding, or orders for this material should be sent to:
E. I. du Pont de Nemours & Company, (Inc.)
Electrochemicals Department
Miscellaneous Sales Division
Empire State Building
New York, New York
or
E. I. du Pont de Nemours & Company, (Inc.)
Grasselli Chemicals Dept.,
Wilmington, Delaware

NEOPRENE IS FUNGUS RESISTANT—The prevention of fungus growth is of considerable importance in obtaining maximum service life of products which contain fabric and which are used under damp, humid conditions. Neoprene will not support the growth of fungus spores even under the most favorable conditions. Therefore, no added fungicide is needed when making up stocks for use in items such as life rafts, pontoons, hose, belting, boots, cables and mining accessories. Cotton fabrics which have been frictioned and skimmed with a neoprene compound do not deteriorate by mold growth.

BUNA S is expected to replace natural rubber at an accelerating rate during the coming months as additional plants begin producing this material. We will be pleased to assist you in any of your Buna S compounding problems. Please continue to bring these problems to our attention so that we may work together in the development of the best possible Buna S compounds.

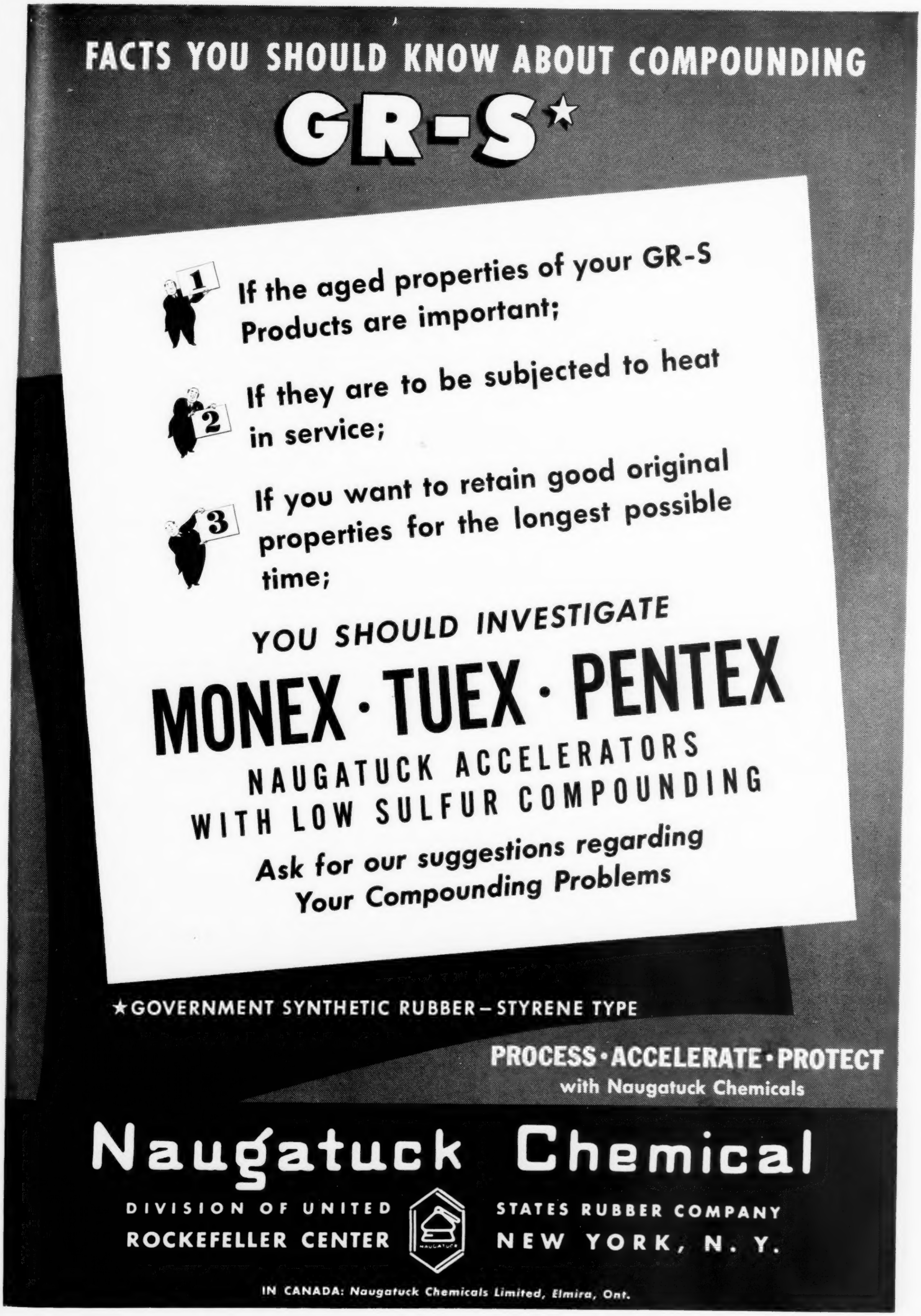
NO TOXICITY—An independent investigator, after making numerous tests, gives the following statement: "There was no evidence whatever among our subjects that neoprene sponge is irritating or toxic to the human skin."

DU PONT
REG. U. S. PAT. OFF.

RUBBER CHEMICALS DIVISION

BETTER THINGS FOR BETTER LIVING . . . *Through Chemistry*

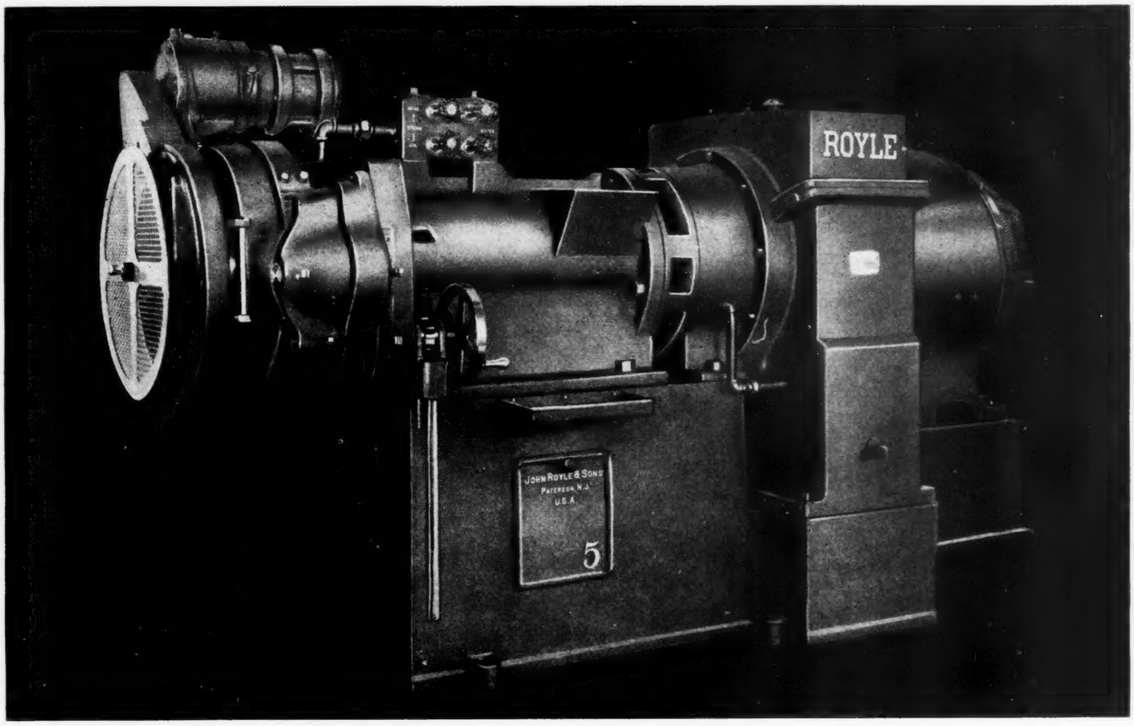
INDIA RUBBER WORLD, July, 1943, Vol. 108, No. 4. Published monthly by BILL BROTHERS PUBLISHING CORP., Printing Office, Philadelphia, Pa. Editorial and advertising offices, 386 Fourth Avenue, New York 16, N. Y., U. S. A. Entered as second-class matter October 5, 1889, at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription, United States and Mexico, $3.00 per year; all other countries, $4.00; single copies, 35 cents.


FACTS YOU SHOULD KNOW ABOUT COMPOUNDING
GR-S★
1
If the aged properties of your GR-S Products are important;
2
If they are to be subjected to heat in service;
3
If you want to retain good original properties for the longest possible time;
YOU SHOULD INVESTIGATE
MONEX · TUEX · PENTEX
NAUGATUCK ACCELERATORS
WITH LOW SULFUR COMPOUNDING
Ask for our suggestions regarding Your Compounding Problems
★GOVERNMENT SYNTHETIC RUBBER—STYRENE TYPE
PROCESS · ACCELERATE · PROTECT
with Naugatuck Chemicals
Naugatuck Chemical
DIVISION OF UNITED STATES RUBBER COMPANY
ROCKEFELLER CENTER NEW YORK, N. Y.
IN CANADA: Naugatuck Chemicals Limited, Elmira, Ont.

ROYLE STRAINERS

ROYLE PATERSON N J

SPEED UP PRODUCTION



ROYLE MANUAL CONTROL BREAKS HEAD SEAL IN A FLASH

These fine strainers have the Royle manually operated head. This Royle strainer head is readily opened for cleaning, as it is only necessary to exert 50 pounds of force with a lever to apply over one ton of force on the segmental gear pitch line. Then a few turns of a hand wheel complete the operation—and the head can be swung open.

FEATURES LIKE THIS MAKE ROYLE STRAINERS FAST AND EFFICIENT

JOHN ROYLE & SONS, Paterson 3, N. J.

Pioneer Builders of Rubber and Plastics Extruders

ARMY E NAVY

LET'S WORK AND FIGHT FOR THE FREE AMERICA WE LOVE.

AKRON, OHIO: *Represented by* J. C. CLINEFELTER, University 3726

LONDON, ENG.: *Represented by* JAMES DAY (MACHINERY) LTD.

JUST as TITANOX pigments give whiteness and brightness to natural and reclaimed rubber, so they do to synthetics.

However, utility is now the keynote of the National Rubber Program. In cooperation, the entire efforts of the TITANOX Rubber Laboratory are devoted to the development of superior physical properties of synthetic rubber.

We will gladly join forces with technical men in the tire and rubber fields in this work whether or not TITANOX pigments are involved.

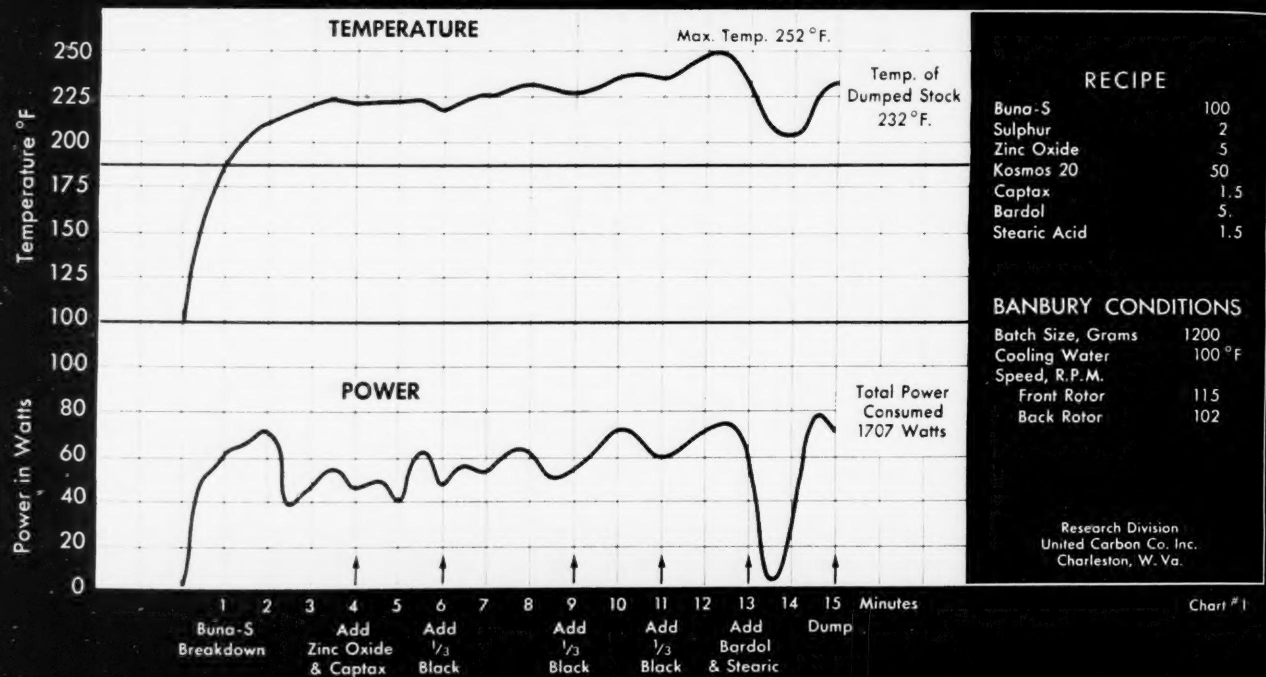
TITANIUM PIGMENT CORPORATION
SOLE SALES AGENT
111 B'way, New York, N. Y. • 104 South Michigan Avenue, Chicago, Illinois • 350 Townsend Street, San Francisco, California 2472 Enterprise Street, Los Angeles, Calif.

TITANOX
REG. U.S. PAT. OFF.

TITANOX
TRADE MARK

TEMPERATURE RISE & POWER CONSUMPTION IN BANBURY "B"

KOSMOS-20 BUNA-S



This is the first of a series of charts depicting the temperature rise and power consumption of UNITED BLACKS in Buna S when mixed in a Banbury.

RESEARCH DIVISION

UNITED CARBON COMPANY, INC.

CHARLESTON, W. VA.

0
2
5
0
1.5
5.
1.5

NS
0
0 °F

5
2

art #1


New Jersey
zinc

FOR HEAVY DUTY PERFORMANCE

Continental "A"

THE PROVEN REINFORCEMENT

SEND FOR SAMPLES

ONE OF THESE GRADES IS YOUR BLACK: Continental "AAA" low heat generating, extremely easy processing · Continental "AA" low heat generating, easy processing Continental A medium cure, medium processing · Continental D standard.

FOR HIGH CONDUCTIVITY—Continental R-20, R-30, R-40, and a complete line of color blacks.

CONTINENTAL CARBON COMPANY

295 Madison Avenue, New York, N. Y. · SALES OFFICE: 311 Peoples Bank Bldg., Akron, Ohio

Sales Representatives: Ernest Jacoby & Co., Boston, Mass. · Marshall Dill, Los Angeles and San Francisco, Calif.

July, 1943

VOLUME 108 NUMBER 4

A Bill Brothers Publication

INDIA RUBBER WORLD

CONTENTS

DEPARTMENTS

MARKET REVIEWS

STATISTICS

ARTICLES

INDIA RUBBER WORLD *assumes no responsibility for the statements and opinions advanced by contributors.*

B. BRITTAIN WILSON, General Manager

ROBERT G. SEAMAN, Technical Editor

M. J. McCARTHY, Circulation Manager

S. R. HAGUE, Managing Editor

Published monthly by Bill Brothers Publishing Corp., 386 Fourth Ave., New York 16, N. Y. Chairman of Board and Treasurer, Raymond Bill; President and General Manager, Edward Lyman Bill; Vice Presidents, Randolph Brown, B. Brittain Wilson.

A BILL BROTHERS PUBLICATION

Subscription price—United States and Mexico, $3.00 per year; all other countries, $4.00. Single copies thirty-five cents. Other Bill publications are *Premium Practice, Rug Profits, Sales Management, Soda Fountain, Grocer-Graphic,* and *Tires.*

INDIA RUBBER WORLD

Published at 386 Fourth Avenue, New York 16, N. Y.

Volume 108 **New York, July, 1943** **Number 4**

"The Second Mile"[1]

The 1943 Goodyear Lecture

L. B. Sebrell[2]

I FEEL particularly honored to have been selected to give the second Charles Goodyear Memorial Lecture. I well appreciate the fact that there are very many others in the Rubber Division who are equally, if not more deserving than I of this honor.

The selection of the proper subject for this lecture has indeed been a difficult problem and one to which considerable time and thought have been given. It was first thought that a general discussion of polymerization in its various aspects and means of determining the types of polymerization would make a satisfactory topic for this lecture. However upon further consideration it was felt that the subject had been adequately covered by Drs. Mark and Raff in their recent book, "High Molecular Weight Polymers." It seemed somewhat superfluous to repeat in a large measure much of the information which is contained in this book and which would have to be done to make a full discussion of this subject anywhere near complete.

The title, "The Second Mile", was inspired by an address which was given by Dr. Wickenden, of the Case School of Applied Science, upon an entirely different subject. Since this title seemed to suit the synthetic rubber situation as it exists at the moment, Dr. Wickenden's permission was secured to use this title in connection with the present lecture. In its broader aspects the paper purports to cover the status of the synthetic rubber situation as it exists today. For this purpose I have elected to compare natural rubber with the copolymers made from butadiene and styrene, butadiene and acrylonitrile, and the copolymers generally known as Butyl rubber. I have elected to use only these three materials in the comparative study because of the fact that they are the materials which the government proposes to use in the largest quantities to alleviate the present shortage of rubber. It is hoped that the data to be presented will give a fairly accurate picture of the comparative or relative values of these synthetic rubbers and natural rubber. It is not the purpose of this paper to enter into any discussion regarding the methods of manufacture of any of these materials since these are more or less of a secret nature and ought not be discussed in a paper of this type.

After having concerned ourselves with the synthetic rubbers in their present state of development, it is proposed to pay some attention to the probable structure of these polymers and, if possible, to indicate some trends of research which might profitably be followed in order to improve these materials for the general purposes for which they are intended.

Polymerization—Historical

The polymerization of organic substances has been known for considerably more than 100 years. Berzelius (1) was the first to use the term "polymerization" and to define it as indicating those compounds which possess the same properties, but have a different total number of atoms. Greville Williams (2) is generally credited with the first preparation of isoprene when he separated this material from the products of destructive distillation of rubber. However Himly (3), while investigating the fractional distillation of rubber, isolated a distillate which he called "Faradayin." He also coined the term "Kautchin" (now known as dipentene) for one of the higher boiling fractions. However these investigators did not again polymerize these rubber-like products to any compounds of a higher molecular weight.

G. Bouchardat (4) is usually given the credit for being the first person to synthesize a rubber-like material from a liquid of low molecular weight. In 1875 this French scientist advanced the idea that isoprene is a primary unit of natural rubber and succeeded in producing from the distillation products by the process of polymerization a rubbery polymer. He brought about this conversion by heating isoprene with fuming hydrochloric acid and obtained a product which he described as being elastic and possessing the characteristics of rubber. This work of Bouchardat was followed by that of Tilden (5) and Hofmann (6), who did further work on the polymerization of isoprene and the methods by which it could be polymerized. Tilden showed that isoprene could be obtained by the pyrolysis of turpentine, and that by treatment with hydrochloric acid it would also undergo spontaneous polymerization. He also brought about the polymerization of isoprene by the use of nitrosyl chloride. The work of Tilden was carried on by Hofmann in Germany. This investigator [in connection with Coutelle (7)] obtained the earliest German patent on the production of synthetic rubber by the heat polymerization of isoprene with or without the addition of polymerizing agents.

In 1910, Matthews and Strange (8) in England and

[1] Presented at the A. C. S. spring meeting at Detroit, Mich., Apr. 15, 1943.
[2] Manager, research and new products, Goodyear Tire & Rubber Co., Akron, O.

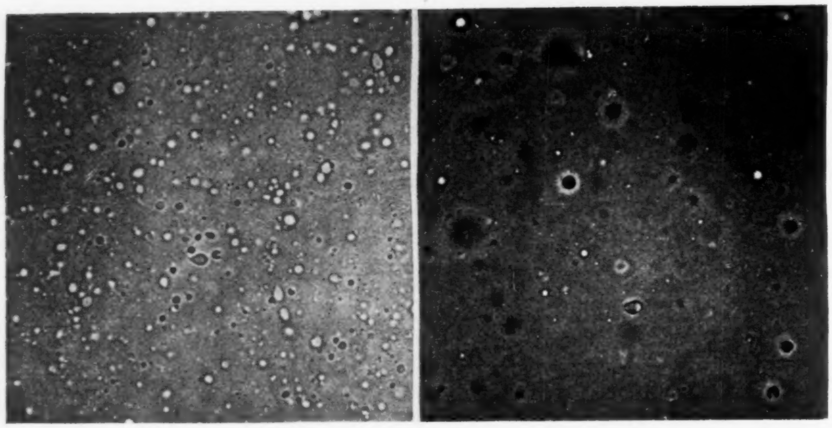
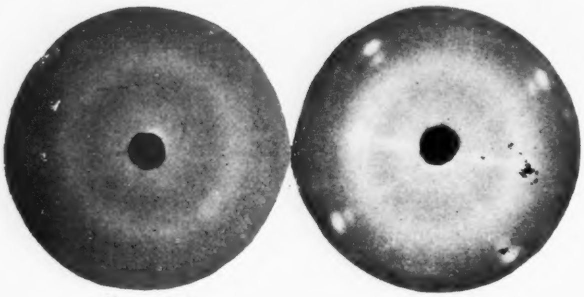


Fig. 1. Natural (*Left*) and Synthetic (*Right*) Latices (x 1300)



Unstretched Stretched

Fig. 2. X-Ray Patterns of Butyl Rubber

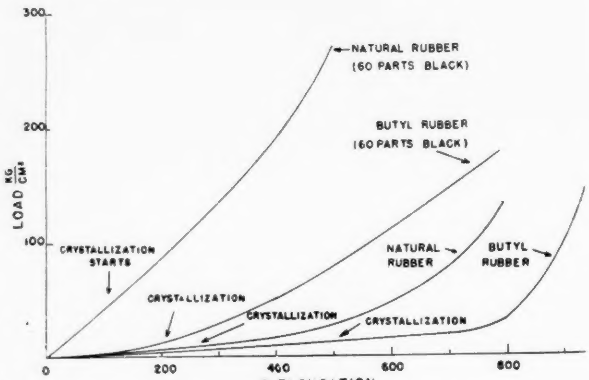


Fig. 3. Stress-Strain Curves—Natural and Butyl Rubber

Harries (9) in Germany reported almost simultaneously that metallic sodium catalyzes the polymerization of isoprene to synthetic rubber. The claims of these early patents specify subjecting isoprene to metals of the alkali or alkaline earth groups, their mixtures, alloys or amalgams in such a manner that the metals are wholly or largely in contact with the vapor of the hydrocarbon.

The story of the manufacture of synthetic rubber in Germany during the First World War is very well known. During this period a derivative of butadiene, that is, 2-, 3-dimethyl butadiene, was polymerized by means of sodium to give Methyl rubber. During the years 1914-18 some 2,400 tons were said to have been manufactured. One or two different grades of this type of synthetic rubber were prepared at that time, almost all the dimethyl butadiene being made from acetone.

After the First World War several attempts were made to carry on the development of synthetic rubber in various laboratories, both in the United States and abroad. I think it can be safely said that it was not until it was generally known in the United States that the Germans were again devoting serious attention to the synthetic rubber problem that concerted effort was put forth here to produce a good synthetic rubber.

In Italy the polymerization of butadiene and related hydrocarbons by the sodium method has been fairly well developed, and samples of the Italian rubber which have been received in this country made by sodium polymerization have been of a relatively high quality.

However it was not until the general application of the emulsion technique of manufacturing synthetic rubbers that they began to assume an important role in supplying large quantities of material. One of the first patents on the emulsion polymerization of synthetic rubber is that granted to R. P. Dinsmore (10). This patent was followed in 1930-33 by the patents on the emulsion polymerization of mixtures of butadiene and styrene and butadiene and acrylonitrile which were issued to the German chemists Tschunker and Bock (11), Konrad (12), and other investigators in that country. From the basic foundation of these emulsion-type copolymers and variations in this technique our entire picture of synthetic rubber has been built up. Perhaps exceptions to this statement should be made, since the polymerization of the Butyl rubber does not follow this technique, and in this case a special method of polymerization has been applied, the exact nature of which has not as yet been given wide publicity.

In the following sections it is proposed to point out the differences and similarities between the natural rubber and the three different types of synthetic rubber which have been chosen for comparison in this paper.

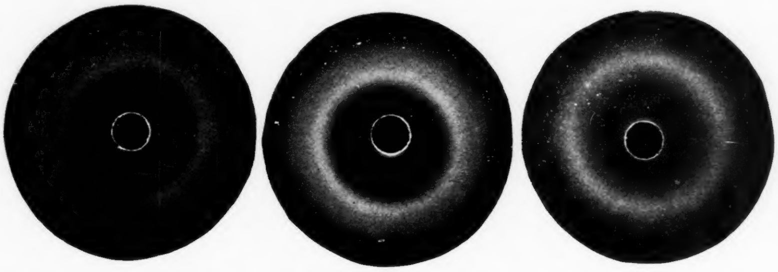
Latex Properties

There is an outstanding difference in the particle size of natural latex and the synthetic latex of any of the copolymers which have been made by the emulsion processes above referred to. Figure 1 represents natural latex and synthetic latex respectively. The synthetic latex, when examined with the ordinary microscope, is of so small a particle size as to be almost invisible. The electron microscope shows the presence of particles, but these particles may be merely aggregations of larger clumps of molecules.

In discussing the difference in particle size with Dr. Kemp, of Bell Telephone Laboratories, he pointed out that

Polybutadiene Polyacrylonitrile Polystyrene

Fig. 4. X-Ray Patterns of Polymers



75 Butadiene—25 Acrylonitrile 50 Butadiene—50 Acrylonitrile 50 Butadiene—50 Styrene

Fig. 5. X-Ray Patterns of Copolymers

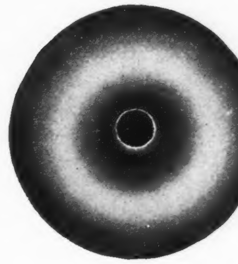


Fig. 6. X-Ray Pattern—50 Butadiene — 25 Acrylonitrile — 25 Styrene

possibly the particle size of the synthetic latex might be directly connected with the physical properties to be obtained from synthetic rubbers. It is common knowledge that the present types of synthetic rubber do not give so good results when vulcanized in pure gum stocks as they do when substantial quantities of carbon black are added.

This brings up the question of whether or not carbon black, being of sub-microscopic size, may act as a grinding medium and upon being milled with the synthetic rubber have either a pronounced surface effect upon the particles of synthetic latex or might act as a shearing medium to break them down and reveal less highly polymerized rubber in the interior of these very small particles. This assumption is, of course, based upon the fact that in milling, the original latex particles are disintegrated, and it has long been known that the outer shells of these particles possess a somewhat higher degree of polymerization than the interior of the natural latex particle. Further studies with the ultra-microscope may disclose additional data of value in determining the difference in particle size between natural and synthetic latex and supply the reason for the differences and the possible significance of such variations.

X-Ray Structure of Synthetic Rubber

A considerable amount of attention has been given to the X-ray diagrams of various synthetic rubbers, but it has not been possible to apply the results of such studies directly to the process of improving the copolymer types of synthetic rubber now under consideration.

The general character of the X-ray diffraction results with synthetic rubbers has been discussed in a previous paper (13). The copolymers of butadiene and styrene and of butadiene and acrylonitrile are amorphous under all conditions. Polyisobutylene and polychloroprene, on the other hand, develop a crystalline structure upon stretching. Stretched Butyl B rubber shows the same crystalline structure as polyisobutylene. "Thiokol" has a somewhat crystalline structure, both stretched and unstretched.

In the cases where crystalline structures are obtained, it is evident that the X-ray patterns can be used to secure information on the chain form. They can be used to evaluate in various indirect ways the strength of the intermolecular forces and the relationships between molecular length, molecular length distribution, and molecular mobility, which in turn finds its reflection in the plastic properties.

The X-ray diffraction results with Butyl B rubber are especially interesting when correlated with stress-strain curves. Figure 2 shows the amorphous pattern for unstretched Butyl rubber and the crystalline pattern which develops upon stretching. Unlike *Hevea* and GR-S, Butyl rubber does not show very marked improvement in tensile strength due to incorporation of gas black, although typical reenforcement occurs for such properties as abrasion, tear, and modulus. Since the tensile strength is closely connected with the crystallinity at high elongations, X-ray diffraction results might be expected to throw some light on this apparently contradictory result.

It was found that the crystallization phenomena in loaded and unloaded Butyl rubber stocks were analogous to those with *Hevea* (14). Evidence of crystallization began to appear at about 500% elongation for the gum stock and at about 200% for a compound loaded with 60 parts of gas black. Spreading of the diffraction spots into longer arcs for the loaded stock indicated that the alinement of the crystallites in the direction of stretching was less perfect than for the gum stock. Thus, although higher elongations are required for crystallization to set in for Butyl rubber as compared to *Hevea*, the effect of carbon black on the patterns in very similar.

Inspection of the stress-strain curves in Figure 3 indicates that there may be a very simple explanation of the apparent lack of tensile reenforcement. Between 800 and 900% elongation the stress-strain curve for the Butyl rubber gum stock rises abruptly, reflecting the onset of a highly crystalline structure which is also indicated by the sharp, intense diffraction pattern. The fact that crystallization sets in at higher elongations, when the molecules are

already very well alined, probably contributes to this perfection, as does the simple and regular chain form of the Butyl rubber molecules. Thus in the gum stock the ultimate tensile strength of the material is nearly realized due to its own crystal reenforcement. The black can contribute little further in this respect, and its interference in the alinement of the crystallites may actually work against a higher tensile strength. For *Hevea*, on the other hand, the onset of crystallization is more gradual, and the resulting structure less regular. The black can furnish effective anchorage points to prevent failure from starting between the crystallites, and a large improvement in tensile strength results.

For copolymers, which invariably show amorphous structures, the use of X-ray diffraction as a means for investigating the molecular structure is severely limited. It is true that even in the case of liquids, the X-rays reveal a fundamental type of molecular structure which consists of a statistical space distribution of neighboring molecules. The only information to be obtained directly from the analysis of such patterns is the average distance of atom neighbors. A comparative study of these amorphous patterns for copolymers has been found to yield some interesting results, even without carrying through the involved mathematical analysis required for their exact interpretation.

The patterns shown in Figures 4, 5, and 6 were taken by Dr. J. E. Field using strictly monochromatic $CuK\alpha$ radiation secured by reflection of the X-ray beam from a rock salt crystal.

The pattern for polybutadiene (Figure 4) is a broad halo, indicating an amorphous structure. In contrast the pattern for polyacrylonitrile shows a sharp diffraction ring, proving the existence of small crystalline regions in random orientation. The pattern for polystyrene indicates that in addition to the usual halo for liquids, there is an inner ring corresponding to a larger molecular spacing. Thus these three polymers give patterns which are readily distinguishable. We wished to know to what extent these structures occurred in copolymers.

Figure 5 shows the pattern for an emulsion copolymer with a 75-25 starting ratio of butadiene to acrylonitrile. This appears to be the pattern of a homogeneous structure. When the starting ratio was 50-50, the crystalline ring of polyacrylonitrile became plainly evident. Two conclusions can be drawn. Either some or all of the acrylonitrile units of the chain molecules were sufficiently numerous and flexible to come within their normal range of action and assume the same structural relationships as for polyacrylonitrile, or the polymer was not entirely a true copolymer and some polyacrylonitrile was formed during the polymerization.

The pattern from a copolymer made with a 50-50 starting ratio of butadiene to styrene in Figure 5 does not show any evidence of the inner polystyrene ring and hence of the polystyrene structure. The presence of the inner polystyrene ring could not be detected until the styrene component was about 70%. Estimating from the completeness of the copolymerizing reaction, this starting ratio was also the composition of the product. Since the molecular weight of styrene is about twice that of butadiene, this is approximately the composition for which the number of each component would be the same.

Control patterns were run for products coagulated from mixtures of polybutadiene and polystyrene latices. Thirty per cent. of polystyrene could be readily detected by the presence of the inner ring. Although this method of X-ray analysis is not so sensitive as might be desired, it shows that for copolymerization of either acrylonitrile or styrene with butadiene, the structure of polyacrylonitrile and of polystyrene respectively tends to make its appearance when the number of molecules approximates the number of butadiene molecules.

In an experiment with a three component system, with starting ratios of 50, 25, and 25 of butadiene, acrylonitrile and styrene respectively, the pattern of Figure 6 was obtained. In this case the presence of polystyrene structure is plainly shown by the inner halo, indicating a different character of reaction for this system as compared to the two component system.

To what feature of the polystyrene structure the inner ring is related is not definitely known. Katz (15) ascribed it to a large spacing of parallel molecular chains brought about by the attached benzene rings. To test this idea, we determined the effect of the temperature of the polystyrene on the relative intensity of the inner and outer halos of the polystyrene pattern. The results are shown in the microphotometer curves of Figure 7. Curiously enough, the pattern does not approach that of monomeric styrene, which is a single halo, as the temperature is raised, but, on the contrary, the relative intensity of the inner ring is increased. At 195° C., for which a microphotometer curve is shown, the polymer had actually melted and become a viscous fluid. Thus the inner ring represents some statistical molecular configuration which is not associated necessarily with the solid state.

Molecular Weight Determinations of Synthetic Rubbers

The molecular weight of the butadiene copolymer with styrene has been determined and compared with that of natural rubber, obtained by the same method, in the hope that this information will be of value in the preparation of an improved type of synthetic rubber. Viscosity measurements, described by Staudinger (16), were used for this purpose. The molecular weight of the butadiene copolymer has also been determined by the ultra-centrifuge method through the courtesy of Drs. Coolidge, Patterson, Bailey, and Nichols, of the du Pont organization. In connection with the determination of molecular weights, the following discussion is of interest:

Benzene Solubility and Swelling Indices. One of the readily observed differences between synthetic butadiene rubbers is their degree of solubility and swelling in solvents, such as benzene, which is a good solvent for the polymer if no considerable degree of cross-linking has taken place. If the degree of polymerization, reaction temperature, or other conditions have caused appreciable cross-linkage, however, a portion of the rubber will be insoluble in benzene regardless of concentration or time of exposure to the solvent. The insoluble portion will be swollen to a degree dependent in turn upon the degree of branching and cross-linkage of the insoluble fraction.

The determination of benzene solubility and swelling index involves the extraction of finely divided polymer at 35° C. for 16 hours and separation of the sol and gel phases with a fine mesh Monel screen. The solubility is determined by evaporation of an aliquot portion of the filtrate and is expressed as per cent. of the original rubber soluble in benzene.

The swelling index is defined as

$$\frac{\text{c.c. of solution retained by swollen gel}}{\text{grams undissolved rubber}}$$

and is calculated by subtracting from the original volume of the solvent the volume of the filtrate and dividing by the weight of undissolved polymer.

The swelling indices have been determined for a large number of butadiene-styrene rubbers of varying benzene solubilities. A good correlation was found for these values, as shown in Figure 8. As would be expected, the insoluble portions of highly insoluble rubbers are less swollen

than the insoluble fractions of rubbers which are almost completely benzene soluble. The correlation of these values of swelling indices and benzene solubilities has been close enough that the swelling index is no longer measured.

VISCOSITY MEASUREMENTS AND CALCULATED AVERAGE MOLECULAR WEIGHTS. Viscosity measurements have been made of the benzene soluble portions of butadiene-styrene polymers in an attempt to determine average molecular weights of the rubbers. The determinations were made in dilute benzene solution (0.1 to 0.3 g./100 c.c.) in an Ostwald capillary viscosimeter at 25° C. The exact concentration of the solution was determined after the viscosity measurements. The preliminary tests showed considerable deviation from linearity of η_{sp} plotted against concentration. It was found, however, that an excellent linearity is obtained by plotting $\log_{10} \eta_r$ against concentration. This correlation was pointed out for a large number of polymers by Kemp and Peters (17). This relationship permits the calculation of average molecular weights, if a satisfactory constant is determined by comparison with osmotic pressure measurements or freezing point determinations. Since osmotic pressure determinations have not yet been made for our samples, we prefer to report our results in terms of intrinsic viscosity, $[\eta]$, defined as the natural logarithm of the relative viscosity divided by concentration. In cases where we have used calculated average molecular weights based on viscosity measurements, we have arbitrarily adopted the constant used by Kemp and Peters, who calculated weight average molecular weights from viscosity data for rubber, neoprene, and Buna 85 as follows:

$$\text{Mol. Wt.} = \frac{\log_{10} \eta_r}{C} \times 0.75 \times 10^4$$

where C in this equation is expressed in unit mols per liter. Their constant was based on cryoscopic measurements for various fractions of natural rubber. Although its use for the synthetics is not rigidly justified, the values used in our work serve the purpose of expressing relative molecular weights. Calculated on this basis the average weight molecular weights for completely benzene soluble butadiene-styrene rubber of good quality are in the range of 40 to 50,000.

A sample of completely benzene soluble butadiene-styrene (75/25) made in our pilot plant was checked by viscosity measurements and then submitted to the du Pont laboratories for ultra-centrifuge tests. Through the courtesy of Cole Coolidge, G. D. Patterson, E. D. Bailey, and J. B. Nichols, of du Pont, molecular weight distribution and average molecular weights were obtained.

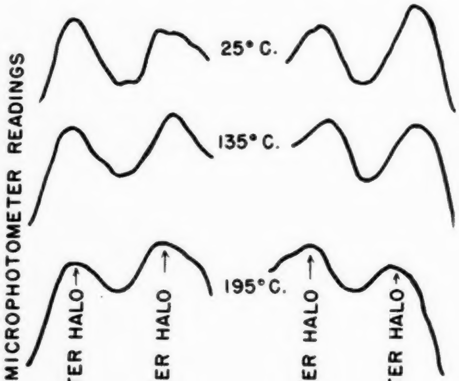


Fig. 7. Microphotometer Curves for Polystyrene

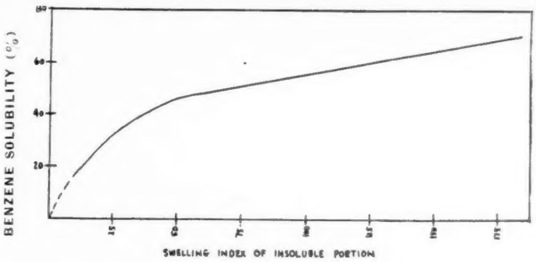


Fig. 8. Relation of Swelling Indices to Benzene Solubilities for 75 Butadiene — 25 Styrene Rubber

The average weight molecular weight found for this sample by the ultra-centrifuge was 92,500. This value is approximately twice that calculated from relative viscosity determinations using the formula and constant referred to above. This value was 44,000. Until a check against osmotic pressure measurements is available, no absolute value is attached to the molecular weights calculated from viscosity values. Since the Staudinger relation applies only to linear molecules, its application to a polymer which may be considerably branched would be expected to give low calculated molecular weights.

Bibliography

(1) J. J. Berzelius, *Jahrsber.*, 12, 63, (1832).
(2) G. Williams, *Proc. Roy. Soc.*, 10, 516 (1860).
(3) F. K. Himly, *Ann.*, 27, 40 (1838).
(4) G. Bouchardat, *Compt. rend.*, 89, 1117 (1879).
(5) W. A. Tilden, *Chem. News*, 46, 120 (1882); *J. Chem. Soc.*, 45, 410 (1884).
(6) A. W. Hofmann, *Ber.*, 1, 198 (1868).
(7) Bayer & Co., German patent No. 250,690 (1911).
(8) F. E. Matthews and E. H. Strange, British patent No. 24,790 (1910).
(9) C. Harries, United States patent No. 1,058,057 (1914).
(10) R. P. Dinsmore, United States patent No. 1,732,795 (1929).
(11) E. Tschunker and W. Bock, United States patent Nos. 1,938,-730-31 (1933).
(12) E. Konrad and E. Tschunker, United States patent No. 1,-973,000 (1934).
(13) L. B. Sebrell and R. P. Dinsmore, *S. A. E. Journal*, 49, 368 (1941).
(14) S. D. Gehman and J. E. Field, *Ind. Eng. Chem.*, 32, 1401 (1940).
(15) J. R. Katz, *Trans. Faraday Soc.*, 32, 77 (1936).
(16) H. Staudinger, "*Hoch-Molekulare Organische Verbindungen*", Berlin, J. Springer, 1932.
(17) A. R. Kemp and H. Peters, *Ind. Eng. Chem.*, 33, 1263 (1941).

(*To be continued*)

Uses of "Vinyon" Elastic Yarn

The entire output of elastic "Vinyon", manufactured by the American Viscose Corp., is currently going into articles connected with war activities, where it is replacing rubber. Considerable quantities are being used by the Army for the canopy suspension cords of jungle hammocks, an application in which the product's ability to resist deterioration caused by heat, humidity, and the effects of weather are particularly valuable. It is also being used in the waistbands of the underwear and exercise uniforms issued to the WAACS, in metatarsal pads used by industrial workers to support the balls of their feet, and in elastic tapes for industrial workers' goggles.

Rubber after the War—I

K. E. Knorr[1]

> IT IS not easy to speculate on the future of the rubber market. However, the controversial issues are important, and their examination should not be postponed. At present we cannot know the precise factual setting of the future, but the principles involved will not change and, therefore, can be applied to different factual assumptions. The views given in this article are those of an economist and should prove of considerable value to the increasing number of people interested in this subject.
>
> EDITOR

THE first synthetic rubber plants built by the government have started to produce rubber, and as new factories commence operation, output will increase rapidly. When Rubber Director William M. Jeffers released his Third Progress Report in May he expected a total of 275,000 long tons of synthetic rubbers to be produced during 1943. The entire plant production program is presumably to be completed in the course of 1944.

At this date it is impossible to predict exactly the total synthetic rubber manufacturing capacity that the United States will possess at the end of the war. The Baruch Committee recommended a program of 1,037,000 tons rated capacity. In February, 1943, a capacity of 813,000 tons had been authorized, and top priority ratings required for the immediate construction of a plant capacity of 452,000 tons were accorded with the understanding that the remainder of the authorized program would be implemented in 1944. The cumulative pressure of demand, military and civilian, in the United States and in Allied countries may well lead to an expansion of the program thus far authorized. It has become evident, moreover, that the actual capacity of the larger plants can be expected to exceed rated capacity by a margin of between 15 and 20%. On the other hand competitive uses for critical materials and instruments may force a curtailment of the goal set by the Baruch Committee report. The possibility of unforeseen production disappointments must also be reckoned with. Predictions, therefore, range all the way from 800,000 to 1,600,000 tons of actual capacity. However it seems safe to assume tentatively that the United States will have a total plant capacity for producing between 1.0 and 1.2 million tons of artificial rubbers.

The guayule program, originally planned to cover 200,000 acres and more, has been drastically reduced by a recent order of Mr. Jeffers. Besides conflicting with the food production effort, it could not be expected to yield substantial quantities of guayule rubber before synthetic rubber production is in full swing. If the present program is continued, no more than about 20,000 tons of guayule rubber will be produced in 1944 and subsequent years. Because of shortages of suitable land, manpower, and critical materials, experiments with other plants cultivable in the United States, such as goldenrod and the Russian *kok-saghyz*, are unlikely to pass beyond the experimental stage. Compared with the magnitude of the synthetic rubber program, only negligible amounts of rubber can be anticipated from these sources.

The Post War Problem

Will the huge synthetic rubber industry now in the process of construction survive the war, or will it be scrapped wholly or partially when the prewar rubber supply of Malaysia is again freely accessible to this country? Mr. Jeffers has declared that he is opposed to "junking anything" and that the new rubber plants are definitely here to stay. Numerous Congressmen, business leaders, technicians, and journalists have advanced similar views. Many, indeed, seem to assume continued operation of the bulk of the synthetic rubber industry as a matter of course. This assumption, however, is clearly debatable.

Conceivably, the synthetic products may be as cheap in relation to quality as plantation rubber. Even if this point is true, only a major portion of the industry will be certain to survive the war, for the contemplated production capacity is greatly in excess of the prospective postwar capacity to consume. At least one-third of plant capacity would have to be eliminated in order to bring the rest in line with the projected level of absorption. This measure of contraction could hardly be opposed. On the other hand, if synthetic rubber should be more expensive, and perhaps much more expensive, than the natural material, then a real problem, fundamentally political, will arise. In that case a majority of the erected plants could continue operation only with important assistance by tariff protection or some other form of subsidization. At the Second Inter-American Conference on Agriculture in Mexico City last July, Secretary of Agriculture Wickard "expressed the feeling" that synthetic rubber factories "should not be operated behind a tariff wall"; and, in a letter to *The New York Times* Vice President Wallace argued spectacularly that postwar protection of the United States synthetic rubber industry might well become the cause of World War III.

The question of protection is indeed the crux of the rubber problem that will have to be solved when peace comes. Should the respective shares of natural and synthetic rubber in United States consumption be determined competitively on the basis of comparative prices and qualities? Or should United States production of synthetic rubbers be subsidized in order to enjoy an artificial price advantage over the plantation natural rubber?

The problem posed in these questions would, of course, not arise if the postwar demand for rubber were to expand to an extent that would absorb all of the world's output of both natural and artificial rubbers. However this expansion is not likely to happen within the next decade. Excluding reclaimed rubber, but including synthetic materials, the average annual world consumption of rubber from 1936 to 1939 was approximately 1,100,000 tons. World output capacity in 1939 can be estimated at around 1,700,000 tons—more than 50% in excess of average absorption.

Following the termination of hostilities, the demand for rubber will not immediately settle down to "normal" trends. As a result of the liquidation of private indebted-

[1] Food Research Institute, Stanford University, Calif.

ness and of sharply expanded savings, on the one hand, and the accumulation of a deferred demand for many rubber goods, on the other, the rubber market in many countries will experience an exceptionally heavy demand. Demand for rubber in the form of tires and tubes will figure eminently in this development. According to a nationwide survey recently conducted by the U. S. Chamber of Commerce, 1,259,000 persons reported that they intended to buy new automobiles after the war. This number can be expected to be doubled and, not improbably, trebled by the time peace is restored. There also will be a strong replacement demand for casings and inner tubes. Up to now civilian cars have been wearing out tires eight times as fast as they were being replaced, and many replacements were of inferior quality. More tires will be allocated to civilian use as the rubber situation becomes less tight, but it is doubtful that replacements will satisfy demand during the war. A considerable volume of deferred demand will have accumulated also for other rubber articles, and rubber goods manufacturers will embark upon a sizable restocking program. It can be taken for granted, therefore, that over a transition period of two or three years the postwar rubber market will be characterized by an abnormally heavy demand.

Thereafter the development of rubber consumption can be expected to resume its normal trend. Despite the possibility of temporary setbacks caused by an eventual postwar depression, this trend can be assumed to be firmly upward. It is impossible to foresee the rate of its ascendance at this time, but a certain range of probable proportions can be suggested.

Before the war the sales of tires and tubes accounted for roughly two-thirds of the world's consumption of rubber. Including the numerous other rubber articles contained in motor vehicles, more than 70% of the world's rubber consumption was tied up with automobile usage. There is no reason to expect an abrupt change of this proportion after the war. The exceedingly complex demand for automobile usage is a function of numerous variables such as price, credit terms, the cost of fuels and servicing, the availability and quality of roads, shifts in consumers' preferences, and population changes. The primary factor determining the level of automobile purchases, however, is the development of "supernumerary income" available for the buying of durable consumers' goods. Supernumerary income—what is left of real income after the payment of subsistence living expenses, insurance, taxes, etc.—changes with the volume and the distribution of national incomes.

No doubt favorable developments in this direction would stimulate a vast expansion of car usage and augment the derived demand for rubber tires and tubes all over the globe. Present projects for smoothing the fluctuations of the trade cycle, if successful, will serve to render income less unstable. There also is no sign that the secular trend toward increasing productive power will come to a stop, although spreading patterns of uneconomic resource use, inspired by economic nationalism, in many instances exert retarding influences. While not impossible, a spectacular advance of consumers' real incomes is therefore not indicated for the near future. Hopes for the early motorization of China, Latin America, and other economically backward areas should not be set too high. The elevation of their planes of living and the building of an adequate net of suitable highways and service facilities can be only a very gradual process. On balance it seems unsafe to count on much more than a resumption of the secular upward trend of the prewar decade.

Certain technological trends, indeed, operate toward a

United States Rubber Co.

Typical *Hevea* Rubber Plantation in Sumatra

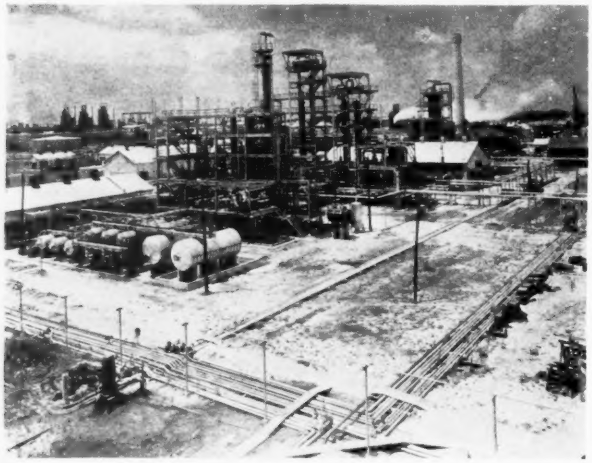
reduction of the rubber volume consumed in automobile usage. The manufacture of a new tire with a synthetic rubber tread and, perhaps, synthetic rubber sidewalls increasing its longevity by 50 to 100%, would diminish the replacement demand for tires in striking degree. Construction of markedly lighter automobiles would exert a decreasing influence on the volume of rubber absorption. Invention of a satisfactory tubeless tire would save at least 7% of the rubber content of the conventional casing, tube and flaps combined. The substitution of monofils of the nylon-plastic type for cotton or rayon cords as a new kind of tire reenforcement would permit the manufacture of much lighter and thinner tires. Rubber saving inventions of this kind may be numerous and, hence, have to be reckoned with in estimating future demand volumes.

A considerably increased quantity of rubber will certainly find application after the war, as compared with prewar years, in the construction and operation of civilian airplanes. The consumption of rubber in tires and tubes is capable of expansion in the field of farm vehicles. Some extension can be expected in the demand for rubber shoes and boots, after tires and tubes the largest single item in the list of rubber-containing articles. Besides these large-scale applications, the rubber industry before the war marketed many thousands of rubber goods for sundry industrial and consumer uses. A multiplication of these uses has been predicted by competent representatives of the rubber industry, in spite of the fact that plastics will displace rubber in applications (hard rubber articles) in which it has been used for its plastic rather than its elastic properties.

In the industrial field rubber will find increasing application as a spring, insulating, and coating material. Rubber conveyer belts, many miles long, have been devised for the hauling of building materials. The possibilities of increasing rubber consumption in the textile, clothing, furnishing, medical, and many other trades are immense. Experiments with rubber as a roofing and paving material may be resumed. Indeed, as a British manufacturer put it: "You can do anything with rubber except eat it." Yet, while numerous new applications of rubber will certainly cause rubber consumption to expand greatly, the development of specialty into new bulk uses, technically quite feasible in some instances, will largely depend upon the availability of cheap rubber. Only if the price of both

synthetic and natural products are low and reasonably stable, will these markets expand vigorously.

Thus, while the expanding consumption of rubber in the future is potentially enormous, it would be rash to anticipate a too rapid realization of these potentialities. For purposes of the present discussion we assume that, following exceptionally large absorption in the transitional period, rubber consumption will average 1,600,000 tons annually for a period of at least five years. This compares with 1,100,000 tons in 1936-39, 840,000 tons in 1932-35, 700,000 tons in 1927-31, and 480,000 tons in 1922-26. The projected future rate of increase, therefore, may prove overstated rather than underestimated. What will be the picture on the supply side?



Part of a Modern Rubber "Plantation" Operated by Standard Oil of La. for the Government

Supply of Rubber after the War

When Japan conquered the chief rubber growing areas of the Far East, the production capacity of the Malaysian *Hevea* plantations was estimated at about 1,550,000 tons and, under normal conditions, would have grown to at least 1,600,000 tons by 1943. The British and Dutch did not apply the scorched-earth policy to their rubber plantations. Nor are the Japanese likely to do so when they are forced to evacuate the countries involved. The reason is simple: *Hevea* trees are not easily destroyed. They do not burn. They would have to be cut individually, and there are hundreds of millions of them. Nor could the Japanese military expect to weaken their enemy by such a campaign of destruction, for by that time the synthetic rubber industry will be able to produce enormous supplies. Mature *Hevea* trees also are capable of prodigious passive resistance when left to themselves. Immature rubber trees in existence when the Nipponese overran these countries represented only a trifling percentage of the total acreage under *Hevea* cultivation. Though jungle growth may move in on fairly young trees, neglect of cultivation and general maintenance work does not harm the mature stands. In fact a prolonged period of non-tapping rests the trees and will result in flush production once tapping is resumed. Smoke houses, milling machinery, and other implements essential to the operation of a rubber estate will no doubt sustain much damage, but these constitute only a very small fraction of its physical and capital assets. It is the replacement of these facilities, the rebuilding of transportation systems, and the reorganization of the labor and food markets which will require one or two years before the Malaysian rubber plantation industry can resume normal production. It seems safe to assume, therefore, that no more than 10% of the Far Eastern rubber production capacity will have been definitely destroyed when these countries are liberated.

Increased quantities of natural rubber will be forthcoming from Latin American and African producing areas. While the output of wild rubber will surely decline as a result of heavy overtapping of easily accessible trees during wartime, production of plantation rubber is likely to expand. As to artificial rubbers, the plant capacity of countries outside the United States must be taken into account. Of these the Soviet Union and Germany were the largest producers before the war. While their manufacturing facilities may have been partially destroyed in the course of the war, they must be expected to be rebuilt when peace comes. Smaller factories are located in several European countries and in Japan. Canada is constructing a plant that will turn out 40,000 tons of synthetic rubber per annum. Following the postwar transition period, the world's total production capacity may be estimated as follows (in terms of long tons):

Natural Rubber	
Malaysia	1,400,000
Latin America, Africa	100,000
Synthetic Rubbers	
United States	1,100,000
Canada	40,000
Russia	90,000
Germany	70,000
Other countries	50,000
Total	2,850,000

A total output capacity of 2,850,000 tons, faced with an average demand of 1,600,000 tons per year, means a surplus capacity of more than 75%. Needless to stress, some of the figures on which this calculation is based may prove erroneous; but the errors are likely to be compensatory. The prospect of a huge excess of production capacity is fairly certain. How to deal with this surplus problem will be an inevitable question in postwar years.

Some businessmen and rubber chemists identified with the synthetic rubber industry have expressed convictions that the price of the artificial material will shortly be as low as that of the natural product. In that case, it is assumed, the war-born industry will be able to stand on its own feet and will need no protection for survival in the postwar world. The prospect deserves analysis.

(To be continued)

Native Sulphur in April, 1943

Although output of native sulphur remained low in April, 1943, shipments were higher than in 1942, according to the United States Department of the Interior. During the first four months of 1943 production was 23% and mine shipments 12% less than in the same period last year. But much of the demand was satisfied by withdrawals from producers' stocks away from the mines; and when this tonnage is taken into consideration it is apparent that total sales in the January through April periods were about 0.6% greater in 1943 than in 1942. Opening of barge traffic on the Mississippi and active sales combined to cause a sharp rise in mine shipments, which were 31% greater in April than in March. Total producers' stocks are being slowly depleted, but at the end of April were still 155,661 long tons greater than in April, 1942.

The Government Synthetic Rubber Plant at Institute, W. Va.—I

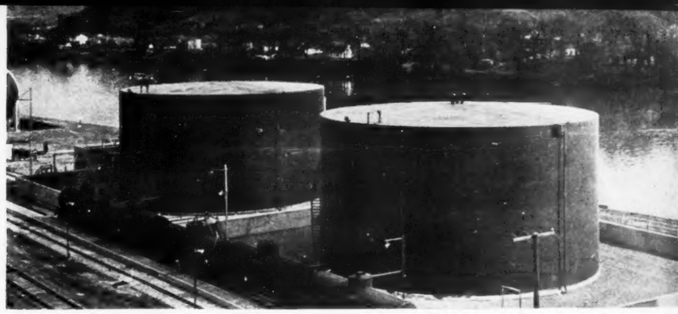


Fig. 1. Two of the Five Alcohol Storage Tanks

R. G. Seaman

ON MAY 24, 25, and 26, one of the largest government-owned synthetic rubber plants located at Institute, W. Va., was inspected by representatives of the newspapers and technical and trade journals. The inspection had been arranged by the Office of the Rubber Director and the companies operating the two main parts of the plant, that is, Carbide & Carbon Chemicals Corp., which operates the facilities for the production of butadiene and styrene, and the United States Rubber Co., which operates the copolymer part of the plant in which the GR-S (Buna S) rubber is produced.

Considered as a whole, the plant has four units of 20,000 short tons annual capacity for the production of butadiene from ethyl alcohol, two units of 12,500 short tons annual capacity for the production of styrene from ethylene and benzene, and three units of 30,000 long tons annual capacity for the production of GR-S rubber from these two main raw materials.

The butadiene and styrene units were designed and built and are being operated for the government by the Carbide & Carbon Chemicals Corp. Construction of the first butadiene unit started in April, 1942, and the first butadiene was produced on January 29, 1943, which is an excellent record of achievement. Construction of the styrene units started in July, 1942, and the first unit began operation on April 7, 1943.

In May, 1942, a contract was signed by the Defense Plants Corp. and the United States Rubber Co. for the construction of a "standard design" copolymer plant at Institute, W. Va. Between May and August, 1942, a committee of engineers representing the four major rubber companies met and developed the plans for the "standard design" plants. Materials were ordered, and construction was started on the first unit about September, 1942. The first GR-S rubber was produced from this plant on March 31, 1943, and on May 26, 1943, one million pounds of GR-S rubber meeting Rubber Reserve Co. specifications had been produced. This represents another excellent record of achievement.

When completed, the Institute plant will have cost $56,000,000, which may be compared with the cost of $80,000,000 for plantations to produce an equivalent amount of natural rubber. The plant will be operated by a staff of 1,250 and will consume about 197,000 gallons of alcohol a year.

The Production of Butadiene

The process for making butadiene from ethyl alcohol used in this plant was chosen by Carbide & Carbon Chemicals Corp. from several methods it had developed through its research program. The alcohol required for this process may be obtained from many sources, i.e., from the fermentation of grain, potatoes, sugar, molasses, or other carbohydrates, or may be obtained from natural gas, refinery gas, or petroleum. For this plant and several others like it, it is expected to use alcohol derived from the fermentation of grain.

The grain alcohol arrives at the plant by tank car and

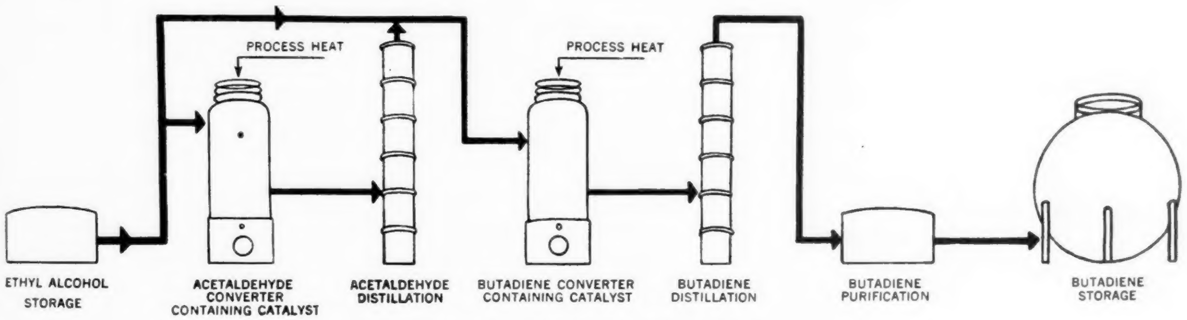


Fig. 2. Butadiene Flow Chart (Carbide & Carbon Process)

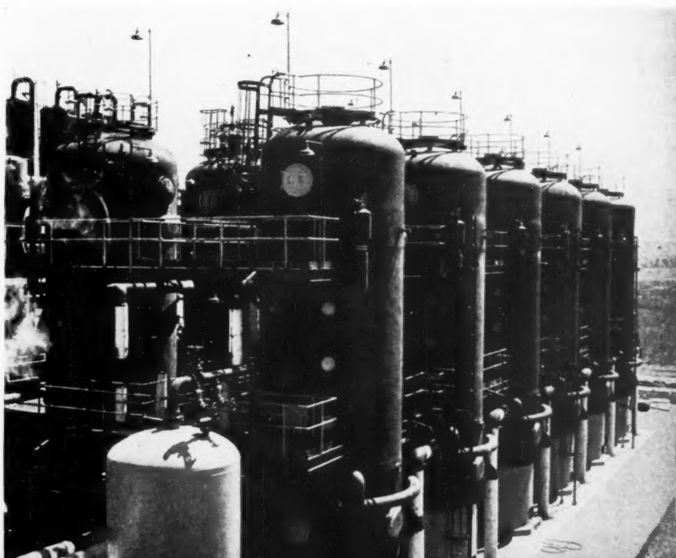


Fig. 3. Converters at One of the Four 20,000-Ton Butadiene Units

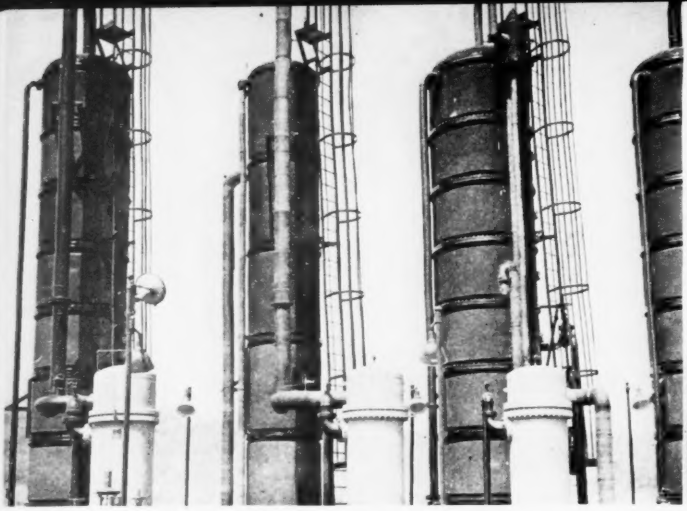


Fig. 4. Distillation Towers at One of the Butadiene Units

Fig. 5. Process Storage Tanks at One of the Butadiene Units

river barge and is stored in five tanks having a capacity of 1,500,000 gallons each, of the type illustrated in Figure 1. Total storage capacity for alcohol is therefore sufficient for continuous operation of all four butadiene units for more than 35 days. The alcohol from the storage tanks passes through two sets of converters containing catalysts and two sets of distillation columns, as shown in the flow chart Figure 2. A portion of the alcohol is converted into butadiene, and the unreacted alcohol and intermediate products are removed for recycling. Actually, as shown in the flow chart, the first set of converters by the action of heat and catalysts produces acetaldehyde from alcohol, and then the former after distillation is combined with alcohol and passed through the second set of converters where, by the application of more heat and with the aid of catalysts, the butadiene is formed. A view of a series of these converters is shown in Figure 3. The crude butadiene is purified by distillation in columns of the type shown in Figure 4, and further purified by washing until it is over the 98.5% purity specified by the Rubber Reserve Co. Process storage tanks for butadiene and other materials are shown in Figure 5, and the main butadiene storage spheres of 250,000 gallons capacity are shown in Figure 6.

Butadiene must be kept under pressure in order to be handled as a liquid, and the large number of compressors used for this purpose are pictured in Figure 7.

Operation and control of the process in the plant are carried out by a relatively small number of trained oper-

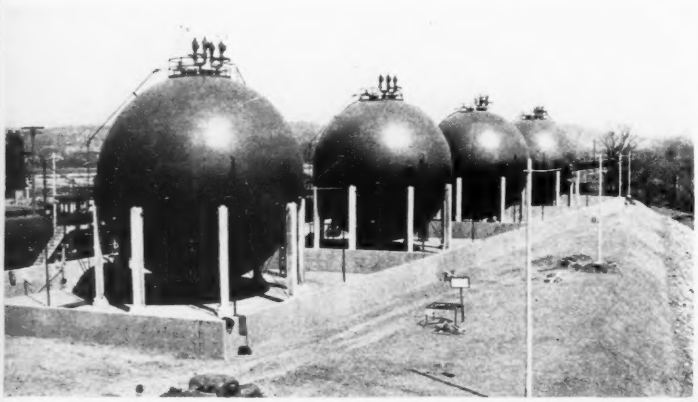
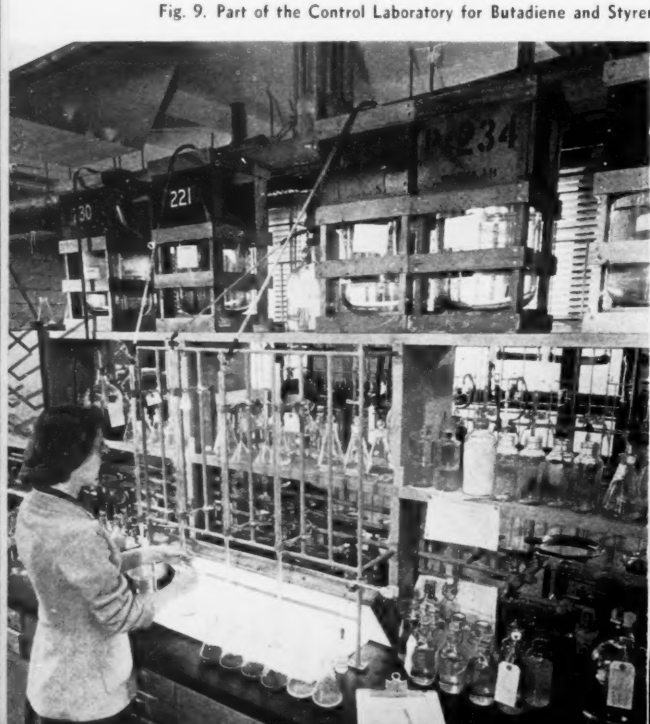


Fig. 6. Butadiene Storage Spheres, 250,000 Gallons Capacity

Fig. 9. Part of the Control Laboratory for Butadiene and Styrene



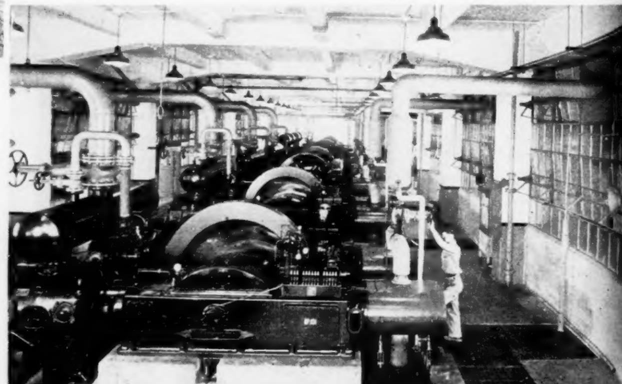


Fig. 7. Compressors for One of the Butadiene Units

Fig. 8. Meter and Control Room for One of the Butadiene Units

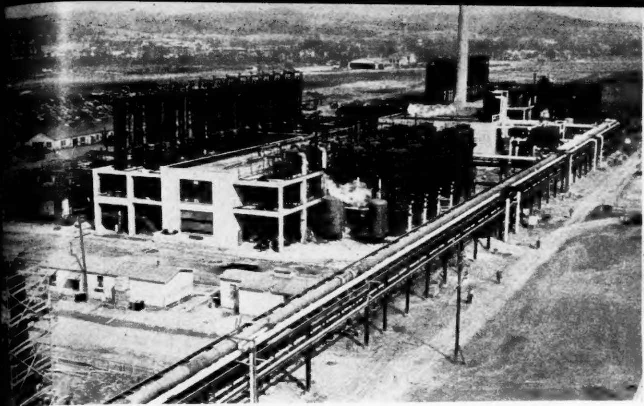


Fig. 10. A Pair of Butadiene Units and a Dowtherm Heat Unit

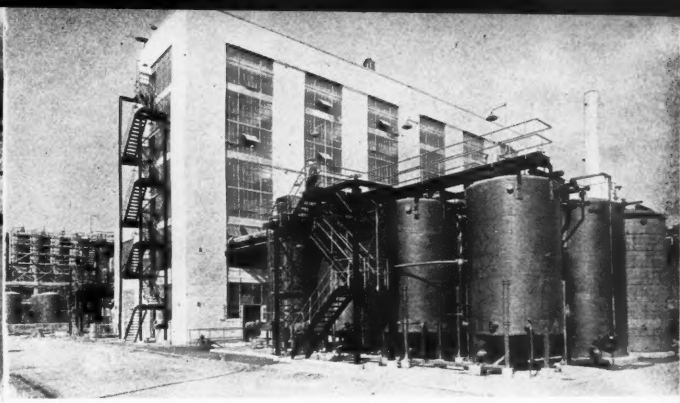


Fig. 11. One of the Styrene Units; Process Storage Tanks in Foreground

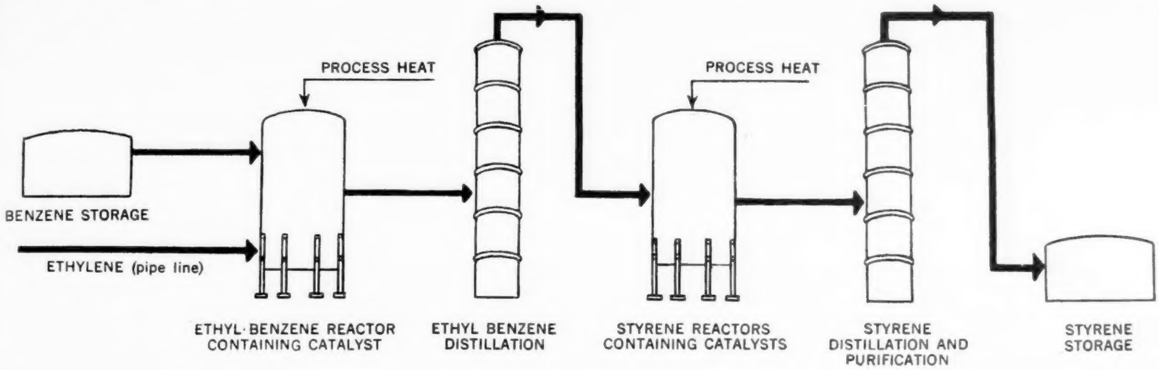


Fig. 12. Flow Chart of Styrene Production (Carbide & Carbon Process)

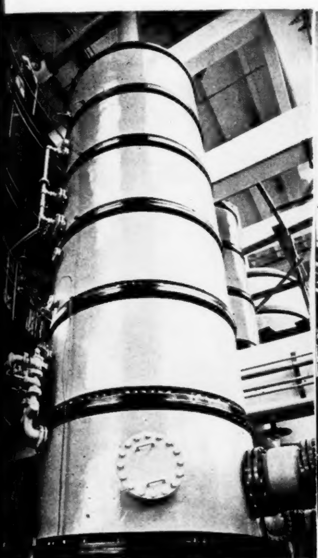


Fig. 13. A Distillation Tower for Styrene Purification

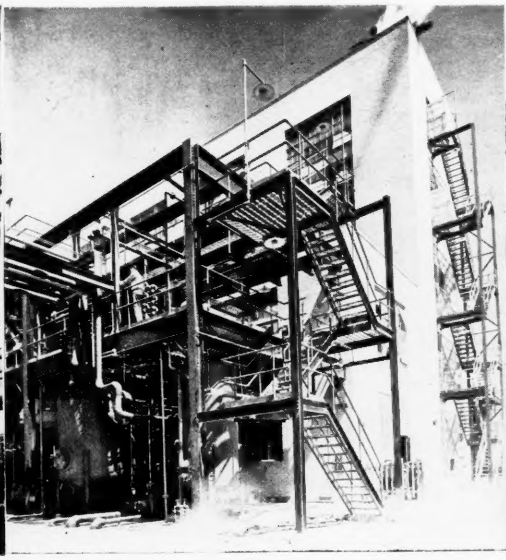


Fig. 14. Front View of a Styrene Unit Showing Reactors

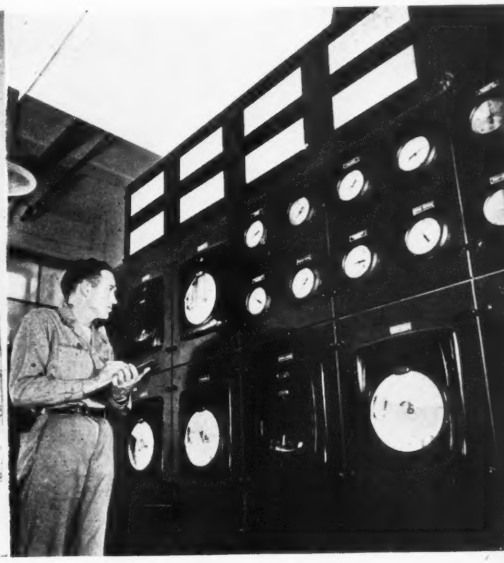
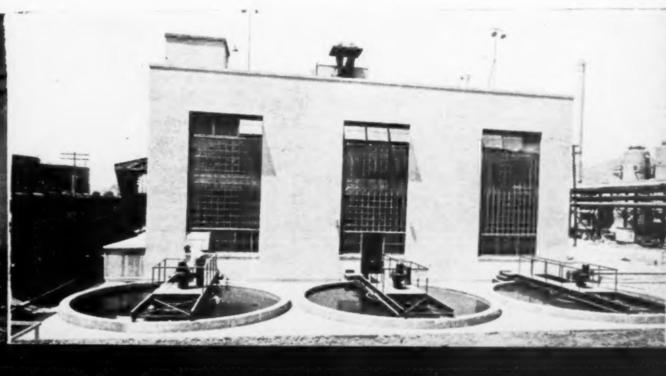


Fig. 15. A Meter Control Board in a Styrene Unit

Fig. 16. The Power House for the Combined Plants

Fig. 17. Water Purification Building and Clarifiers



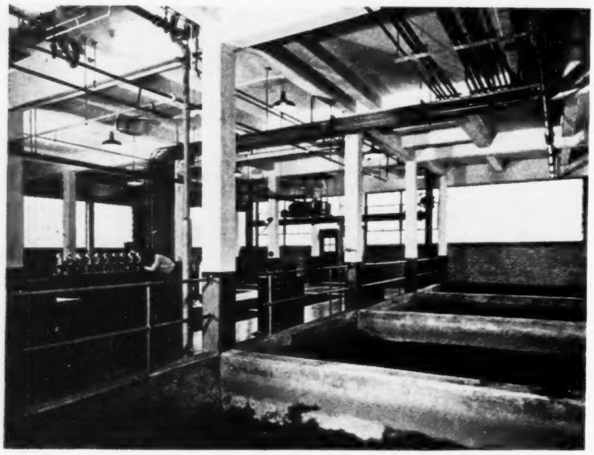


Fig. 18. Interior of Water Purification Building Showing Filter Beds

ators under the supervision of chemical engineers, and Figure 8 is a view of the control room of one of the units. The numerous instruments automatically control and record the different process variables, and a certain amount of analysis of materials in process is also done in these control rooms, although the main control laboratory is in another building. Figure 9 shows a part of the main control laboratory in which many women are employed.

A good view of a pair of butadiene units, with the Dowtherm unit for providing process heat (smaller building with stack) located between them is revealed in Figure 10. The Dowtherm unit provides heat for two butadiene units; the heated liquid is circulated by means of the pipes, which may be seen in the illustration, to the converters where it surrounds the tubes containing the catalysts and reacting materials and provides the necessary heat input and regulation. The catalysts become fouled after a time, and are reactivated by burning off the carbon in air. One or more of the twelve converters comprising each butadiene unit is therefore not always in operation.

Since January, 1943, when the first butadiene was produced at this plant, butadiene has been shipped to various copolymer plants in different sections of the country. When the copolymer plant at Institute reaches full production, practically all of the butadiene made will be used there.

The Production of Styrene

A new process for the production of styrene of high purity had been developed just prior to the rubber emergency by the Bakelite Corp., another unit of Union Carbide & Carbon Corp. This process, intended for use in making polystyrene plastics, was made-to-order for the synthetic rubber program.

The coal-tar benzene used arrives at the Institute plant in tanks cars and is stored in a 1,500,000-gallon tank of the same type as is used for the storage of the grain alcohol. The other main ingredient used, ethylene gas, is produced from refinery gases at the Carbide & Carbon Chemicals plant at South Charleston, W. Va., about six miles away, and is delivered to the styrene units by pipe line.

The benzene and ethylene are combined in a reactor containing a catalyst and with the application of heat converted into ethylbenzene. After removal of the unreacted benzene and by-products in distillation towers, the ethylbenzene is stored in process storage tanks. Figure 11 gives a view of the rear of one of the styrene units, with these process storage tanks in the foreground. A flow chart of the process for making styrene is shown in Figure 12. From the process storage tanks, the ethylbenzene is pumped to a second set of reactors where in two steps and by the use of the proper catalysts, heat and pressure, two atoms of hydrogen are removed from the molecule of ethylbenzene, and styrene is produced. It is then purified by distillation and pumped into the main storage tanks for delivery to the copolymer plant.

Because of the higher temperatures required for the distillation of ethylbenzene and styrene, the distillation columns are housed inside the building, as shown in Figure 13. The reactors, on the opposite side of the styrene building from the storage tanks, may be seen in Figure 14. The pumping equipment is on the ground floor of the building, and the control equipment on the floor above. A section of the motor control board may be seen in Figure 15. In addition to the control provided by these instruments, the styrene units have a warning panel and alarm system which sounds a signal and flashes an illuminated sign stating that the temperature or pressure at a certain part of the process is not correct or that the volume of liquid in a given tank is getting too high. The sign is illuminated first with a red light, but changes to white when an operator begins work to correct the situation. This enables the supervisor or other operators to know that the problem is being worked on and provides for efficient operation.

Additional Facilities

Some of the utilities and services in the section of the plant operated by the Carbide & Carbon Chemicals Corp. are designed to take care of the requirements of the copolymer plant operated by the United States Rubber Co. The power house (Figure 16) contains equipment for handling the electric power used in the combined plants, which is supplied by a local public utility company. Also in this building are six boilers for steam generation capable of producing 1,000,000 pounds an hour at 415 lbs./sq. in. pressure. Powdered coal is used for fuel with an emergency fuel oil supply available.

A tremendous amount of water is used in the combined rubber production facilities of the Institute plant. Figures 17 and 18 show the water purification building in the plant operated by Carbide & Carbon, and similar facilities are to be found in the copolymer plant. For both plants 120,000 gallons of water a minute will be pumped from the Kanawha River when the plants are in full production. Some of the water is purified for use in the chemical processes and for steam, and a smaller amount is used for the cooling of process equipment.

(To be concluded)

New Emulsifying Agents

Spans and Tweens, new emulsifiers and wetting and dispersing agents, which appear promising in preparing aqueous emulsions of hydrocarbons of the type used in the polymerization stage of synthetic rubber manufacture were recently introduced. They are also finding use in the preparation of emulsions of synthetic resins. The Spans are a series of technical long-chain fatty acid partial esters of hexitol anhydrides. The Tweens are a series of polyoxyalkalene derivatives of hexitol anhydride partial long-chain fatty acids. The Spans and Tweens possess a multiplicity of functional groups and are non-electrolytes. They are neither sulphates nor sulphonated products and are essentially free of soap, excess free fatty acids, and inorganic salts. Atlas Powder Co., Wilmington, Del.

Synthetic Rubber Cements—II

D. V. Sarbach[1]

Solvents for Hycar OR Cements

A. Solvent Resistance. Hycar OR-15 has been found to be resistant to as wide a variety of solvents as any other synthetic rubber investigated during the period this study was made. It was found to be more resistant to a large number of solvents than most of the other synthetic rubbers with which it was compared. Hycar OR-15, either vulcanized or unvulcanized, is resistant to mineral oils, vegetable oils, animal oils, gasoline, kerosene, hexane and other aliphatic hydrocarbons, cyclohexane, dilute acids and alkalis, glacial acetic acid, most terpenes, carbon tetrachloride, tetrachlorethylene, Freon-12, aliphatic amines, aliphatic alcohols, aliphatic ethers, carbitol, butyl stearate and oleate, etc., carbon disulphide, and many others.

Table 4. Materials Which Dissolve Hycar OR-15

Chlorinated Hydrocarbons	Boiling Point °C.
*Chloroform	61.2
*Ethylene dichloride	84
*Trichlorethane (Beta)	114
*Trichlorethylene	86.7
*Chlorobenzene (mono)	132
*Chlorotoluene (mono)	159-162
*Dichlorpentanes (#14 Sharples)	95% 130-200
*Ortho-dichlorobenzene	179
*1, 2, 3-trichlorobutane	169.3
Alcohols	
**Benzyl alcohol	204.7
Phenylethyl alcohol	212
Ethers	
Dibenzyl ether	295-298
Phenylethyl ether	172
Dioxane	101.1
Dioxolane	74
Methyl dioxolane	81
Methy cellosolve acetate	144.5
Esters	
Methyl acetate	57.1
Ethyl acetate	77.1
Isopropyl acetate	89-90
Butyl acetate	126.3
Ethyl oxalate	186.1
Ethyl acetoacetate	180.7
Benzyl benzoate	323-324
(Note: There are a large number of high-boiling esters which are usually employed as softeners or plasticizers rather than solvents; however many will actually dissolve unvulcanized Hycar OR-15 although slowly. A few representative members of this group will therefore be included in the ester group.)	
Dibutyl phthalate	339.2
Tributyl phosphate	289
Dibutyl sebacate	265 (4 mm.)
Tributoxy ethyl phosphate	..
Ketones	
Acetone	56.1
Commercial methyl ethyl ketone	..
*Anhydrous methyl ethyl ketone	80.6
*Diisopropyl ketone	123.7
Methyl isobutyl ketone	116.0
Isophorone	215.2
Phorone	197.9
Mesityl oxide	128
Acetophenone	202
Cyclohexanone	155-157
Acetonyl acetone	188-194
Aldehydes	
Furfural	161
Benzaldehyde	179.5
n-hexaldehyde	128.6
Amines	
Aniline	184.4
Dimethylaniline	194
Nitro Hydrocarbons	
**Nitromethane	101.2
**Nitroethane	114.0
**1-nitropropane	131.6
**2-nitropropane	120.3
Nitrobenzene	210
Nitriles	
Acrylonitrile	78-79
Benzonitrile	233.5
Heterocyclics	
Pyridine	115
Thiophene	84
Pyrrole	130
Oils	
"Dispersing Oil #10"	225-300
"Bardol B"	230-300
Miscellaneous	
**1-chloro-1-nitroethane	122-128.5
Ethylene chlorohydrin	128.7
*3-nitro-4-heptanol	..
Benzyl mercaptan	194-195

Table 5. Materials Which Soften or Swell Hycar OR-15

Aromatic Hydrocarbons	Boiling Point °C.
Benzene	80.4
Toluene	111
Xylene	138-142
Ethylbenzene	136.5
Styrene	145-146
Para-cymene	175-176
Tetrahydronaphthalene	205
Mixed Hydrocarbons	
"Solvesso #1"	93-135
"Solvesso #2"	135-174
"Solvesso #3"	182-210
"Tollac"	90% 107.8-115
Chlorinated Hydrocarbons	
Isopropyl chloride	35
Aroclors	..
Halowaxes	..
Chloronaphthalene	263
Alcohols	
Fenchyl	201.4
Esters	
Borate of 1, 3-butanediol	..
Tricresyl phosphate	210-220 (2-3 mm.)
Other high molecular weight esters	..
Ketones	
A few high molecular weight ketones	..
Amines	
Phenylhydrazine	243.5
Piperidine	106
Oils	
Pine oil	..
Phenols	
Phenol	183
Cresol	190-203
Para tertiary butyl catechol	Solid at R.T.
"Dibutyl meta-cresol" (4, 6-di-tert-butyl-3-methyl phenol)	Solid at R.T.
Miscellaneous	
Tertiary butyl mercaptan	63-66

B. Solvent Classification. From an industrial point of view, an ideal solvent should not only exhibit effective solvent action on the subject material, but should possess five other important properties: namely,

1. It should be readily available.
2. It should be inexpensive.
3. It should be non-toxic and without objectionable odor.
4. It should be non-flammable.
5. It should have the desired rate of evaporation.

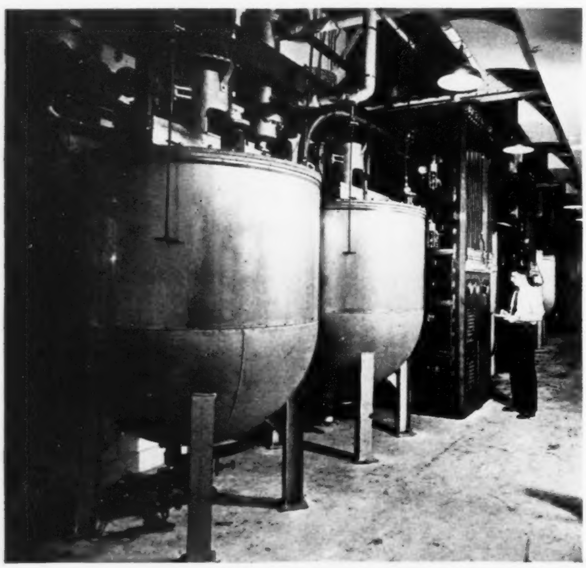
In instances where the evaporation rate is adequate water might well furnish an example of an ideal industrial solvent for materials readily soluble or dispersible in water. For materials requiring organic solvents, ethyl or propyl alcohol, with the exception of flammability, might be considered fairly close to ideal from an industrial viewpoint. Gasoline is one of the most commonly used solvents in the rubber industry and except for point 4 is close to ideal. Its toxicity hazard is not serious. In most cases industrial solvents are compromises between solvent power and the five desirable properties mentioned above.

It has been pointed out that Hycar OR-15 is a highly solvent-resistant material; so the selection of a solvent for the industrial preparation of cements from Hycar OR-15 is a problem requiring considerable attention. Obviously all five of the above desirable qualifications would be most difficult to fulfill; consequently it is important to make a wise compromise in the choice of a solvent or solvents. To aid in the selection of proper solvents, a solubility study on Hycar OR-15 was made. The most common solvents, as well as those representative of larger chemical groups, have been listed in three tables.[2] In Table 4 are listed those materials which readily dissolve Hycar OR-15; Table 5 lists the materials which merely soften and swell it or dissolve it very slowly; in Table 6 may be found the typical non-solvents. A number of materials such as phenol, nitrobenzene, mercaptans, aniline, etc., are included not because

[1] Research chemist, B. F. Goodrich Co., Akron, O.
[2] See India Rubber World, June, 1943, pp. 250-51.

TABLE 6. MATERIALS WHICH DO NOT DISSOLVE HYCAR OR-15

Aliphatic Hydrocarbons and Oils	Boiling Point °C.
Gasoline	38-141
Pentane	37
Hexane	69
Heptane	98.4
Octane	125.5
Etc.	
Kerosene	165-257
Fuel oils	..
Mineral oils	..
Motor oils	..
Vegetable oils	..
Cottonseed	..
Castor	..
Olive	..
Soy bean	..
Linseed	..
Etc.	
"Circo" processing oils	..
Cyclohexane	80.8
Terpenes	
Dipentene	166-191
Turpentine	143-202
Terpineol	218-221
"Terposol #3"	215-218
Chlorinated Hydrocarbons	
Carbon tetrachloride	76.7
Tetrachlorethylene	120.8
2-chlorobutene-2	61-71
Ethyl polychlorobenzene	270-320
Alcohols	
Methyl	66
Ethyl	78.4
Isopropyl	82.8
n-propyl	97.4
n-butyl	117
n-amyl	137.8
Etc.	
Ethylene glycol	197.2
Diethylene glycol	244.8
Glycerin	290
Ethers	
Ethyl ether	35
Butyl ether	142.4
Isopropyl ether	69
"Carbitol"	201.9
Cellosolve stearate	..
Esters	
Butyl stearate	220-225 (25 mm.)
Tetraethyl silicate	168.1
Diethyl stearamide	..
Triacetin	258-259
Butyl acetyl ricinoleate	220-235 (3-5 mm.)
Ketones	
Xylyl undecyl ketone	..
Xylyl heptadecyl ketone	..
Etc.	
Amines	
Diethylamine	55.5-56
Triethanolamine	277 (150 mm.)
Ethylenediamine	117
Dicyclohexylamine	115-116 (8 mm.)
Acids	
Glacial acetic	118.1
Lactic	119 (12 mm.)
Oleic	286 (100 mm.)
Stearic	291 (100 mm.)
Ricinoleic	..
Dilute mineral acids	..
Miscellaneous	
Rubber distillates	..
Carbon disulphide	46.2



A Battery of Large-Size Cement Mixers

they are recommended as industrial solvents for Hycar OR-15, but because they are interesting from an academic point of view and because they tend to illustrate the types of chemicals to which Hycar OR-15 may or may not be resistant. The solvents marked with an asterisk have been found to possess gel-retarding or stabilizing action on Hycar OR-15; while those marked with two asterisks have *pronounced* stabilizing action. All solvents are classified according to their action on unvulcanized or uncured Hycar OR-15. Their action on Hycar OR-25, although not fully investigated at this writing, has been found in many cases to be similar.

C. SOLVENT SELECTION. In selecting a solvent or a mixture of solvents from these tables it is essential to keep in mind several important factors such as:

1. Availability.
2. Cost.
3. Ventilation and fire prevention facilities necessary for the use of the selected solvents.
4. Boiling points and rates of evaporation.
5. Efficiency of solvent action.
6. Advantages of using blended solvents.

The most nearly ideal solvent is worthless if it will not dissolve the basic material which is to be used for a cement. Obviously a solvent from Table 4 is required if a single solvent is to be used. Benzene from Table 5 or gasoline from Table 6, for example, cannot be used by themselves for Hycar OR-15 cements because they lack the necessary solvent power. On the other hand the rate of drying is also important: therefore the use of ortho-dichlorobenzene or dibenzyl ether might well be precluded because of their extremely slow rate of evaporation in spite of the fact that they are good solvents. Dioxane, although a suitable solvent, might not be obtained in sufficient quantities for a particular production requirement; hence ethylene dichloride or methyl ethyl ketone might have to be selected. Of the solvents used alone for cements from Hycar OR-15 the following selection has proved to be most useful to date:

Ethylene dichloride
Trichlorethane
Chlorobenzene
"Dichloropentanes #14"
Butyl acetate
Methyl ethyl ketone
Diisopropyl ketone
Nitroethane[3]
Nitropropanes
1-chloro-1-nitroethane

It is often desirable to use a mixture of solvents instead of one solvent for commercial cements from Hycar OR-15. Mixtures can be selected so that proper evaporation rates are produced, toxicity and/or flammability is reduced, stability of the resulting cement is increased, and viscosity is decreased. In selecting a blend of solvents it is necessary to choose at least one of the components from the effective solvents in Table 4. The second or third solvent in the mixture may then be selected also from Table 4 or from Table 5 or even Table 6 with care. If selected from Table 5 or 6, it is ordinarily referred to as a "diluent" instead of a solvent. In using a blend of two solvents or a solvent and a diluent it is best to add the most effective or true solvent to the batch stock first. When complete homogeneity in the mixer is achieved, the second or third solvents or diluents may then be added slowly. Even when a single effective solvent is employed, it is usually desirable to add only a third or a half of the solvent to the batch first; then stir until homogeneous before adding the remainder of the solvent.

A number of typical solvent combinations follow:

[3] The nitro solvents will retard cure slightly; so acceleration adjustments are necessary when they are used.

		By Volume
1.	Nitropropane or nitroethane	1/3
	"Solvesso #1" or toluene	2/3
2.	Nitropropane or nitroethane	1/3
	Methyl ethyl ketone or diisopropyl ketone	2/3
3.	Chlorobenzene	1/3
	Methyl ethyl ketone or diisopropyl ketone	2/3
4.	Ethylene dichloride or trichlorethane	2/3
	Isopropyl ether or acetate	1/3
5.	Methyl ethyl ketone	2/3
	Butyl acetate	1/3
6.	"Dichloropentanes #14"	1/2
	Butyl acetate or methyl isobutyl ketone	1/2

The first two combinations have been found to produce the most stable cements. Three component solvent combinations have been used successfully, and the combinations are practically unlimited. Cements have also been successfully diluted up to 25% by volume with gasoline without impairing stability, provided that the remaining 75% of the solvents are of the most effective variety such as the nitrated or chlorinated hydrocarbons or the ketones.

Compounding Hycar OR-15[4] for Cements

A. GENERAL. As in any rubber compounding practice, the compounding of Hycar OR-15 for cements is essential for modifying the raw material to perform a definite function or to meet a fixed specification. The modifications made possible by compounding are virtually endless; so only a brief outline of the fundamentals of compounding Hycar OR-15 for cements can be given here. The various compounding ingredients discussed are added to the Hycar OR-15 during mill mixing unless otherwise specified. In discussing concentrations of pigments and other compounding ingredients the expression "P.H.R." has been adopted. This term means "parts per hundred of rubber"; the rubber in this particular discussion is, of course, a generic term applying to Hycar OR-15. Thus 2 P.H.R. of sulphur would mean two pounds of sulphur added to 100 pounds of Hycar OR-15 or two grams added to 100 grams of Hycar OR-15, etc.

B. SULPHUR-ACCELERATOR RATIOS AND ACTIVATORS. Hycar OR-15, like natural rubber, is vulcanized by the action of sulphur, and vulcanization may be accelerated by the common rubber accelerators. In general Hycar OR-15 requires somewhat less sulphur and more accelerator than a natural rubber compound designed to cure at the same rate. Chiefly because of the retarding effect of the relatively high amount of softeners employed in Hycar OR-15 cement compounds, it is advisable to adjust the sulphur-accelerator ratio so that the cement compound will cure a little more quickly than the compound to which it will adhere. For example, suppose a cement is designed to bond two Hycar OR compounds together during a press cure. Assume that the compounds to be bonded will cure in the required time at a given temperature by using 1.5 P.H.R. of sulphur and 1.25 P.H.R. of mercaptobenzothiazole. It would then be advisable to employ from 1.75 to 2 P.H.R. of sulphur in the cement compound and retain the 1.25 P.H.R. of accelerator, or increase the accelerator to around 1.5 P.H.R. and retain the 1.5 P.H.R. of sulphur. The best adhesions are usually obtained when the cement is accelerated with the same accelerator as the compounds to which it is to be adhered.

Many accelerators require zinc oxide and a fatty acid for activation. For Hycar OR-15 cement compounds 5 P.H.R. of zinc oxide is usually used and from 0.5 to 1.5 P.H.R. of an acid such as stearic or lauric. Since the fatty acids are not absolutely essential for cure, there has been a growing tendency to omit them altogether because they will reduce tackiness noticeably. Benzoic acid is often used instead since it has the additional property of stabilizing the cement without retarding cure.

[4] The same generalizations discussed here would also apply closely to Hycar OR-25.

Industrial Glove of Hycar OR-15 Made by a Dipping Process

Low-temperature-curing cements or cements which will cure quickly with a minimum amount of heat are often more in demand than those which require considerable heat and pressure. Low-temperature-curing cements are particularly desirable for the fabrication of fuel cells, balloons, gas masks, etc. In preparing this type of cement compound, ultra-acceleration must be employed. In using fast accelerators it is necessary to employ one of two possible expedients common in cement manufacture. One method is to mix two identical compounds except for adding twice the required sulphur and no accelerator to one batch, and twice the required accelerator, but no sulphur to the other batch. The compounds are then made up into cements separately, but in the same concentrations and are kept in separate containers. Before using, equal volumes of the two parts, one containing the sulphur and the other the accelerator, may be thoroughly mixed together. The second method is to withhold the accelerator and add the sulphur. The accelerator is then dissolved in the solvent, and the calculated amount is added to the cement just before using. This technique is also commonly used with low-temperature-curing natural rubber cements as well.

Some of the more useful low-temperature-curing sulphur accelerator ratios follow:

			P.H.R.
1.	Sulphur		1.5 to 2
	Buytl Eight		3 to 4
2.	Sulphur		2
	2-mercapto 4, 5-dimethylthiazole	85%	2
	2-mercapto 4-ethylthiazole	15%	
	Butyraldehyde aniline		1
3.	Sulphur		2
	2-mercaptobenzothiazole		2
	Butyraldehyde aniline		0.5 to 1
4.	Sulphur		2
	Zinc butyl xanthate		1.5
5.	Sulphur		2.5
	Diethylamine		2
	Carbon disulphide		10-15

(In this type of ultra-fast acceleration, the amine and the carbon disulphide should each be stirred *separately* into the cement just before using.)

C. STABILIZING AGENTS. Stabilizing agents are materials (usually acidic) which will retard the gelling of a cement. Such materials can be added to the Hycar OR while it is being masticated on the mill. They are effective in concentrations of from 1.5 to 2.5 P.H.R., but cannot be used to take the place of the proper processing

technique necessary for the successful manufacture of cements from Hycar OR-15. Several of the so-called stabilizing agents are benzoic acid, tartaric acid, lactic acid, para-thiocresol, benzoyl chloride, and chlorodibutyl carbonate or similar chlorinated esters. Stabilizing agents are particularly useful in cement compounds containing channel black or in compounds containing little or no softener. Cements which are properly prepared and which are pigmented with soft black or mineral pigments and which contain softeners do not ordinarily require stabilizing agents.

D. Pigmentation. Pigments are added to Hycar OR-15 cement compounds for much the same reasons that they are necessary in compounding any rubber batch. They impart higher tensile strengths, produce a smooth product, aid processing or are used for coloring purposes.

1. *Channel Black.* Channel black or "hard" black produces the highest tensile strength cement films. Other things being equal, channel black cements are usually found to be the most tacky. Channel black, however, accelerates gelling and produces an unstable cement. The same phenomenon holds true in the case of natural rubber cements. The optimum amount of channel black is 40 to 50 P.H.R.

2. *Semi-Reenforcing Blacks.* These blacks may be used in concentrations of from 50 to 125 P.H.R. and are preferable over channel types in that more stable cements are produced.

3. *Thermatomic or Soft Blacks.* This type of carbon black (P-33 or Thermax types) produces smooth stable cements which are ideal for spreading or dipping operations. Concentrations may vary from 50 to 150 P.H.R.

4. *Acetylene Blacks.* Acetylene blacks, like the channel variety, cause pronounced instability, but are useful where high electrical conductivity is required.

5. *Mineral Pigments.* Clays are useful for white cements. "Silene", a commercial grade of calcium silicate, is particularly effective for producing good adhesion to fabrics. Iron, chromium, zinc and titanium oxides all produce smooth, stable cements and help to promote tackiness. They are particularly effective in color-matching problems. The heavy metal oxides may be used in concentrations up to 150 P.H.R. Clay and "Silene" concentrations are usually about the same as for the semi-active blacks.

E. Softeners. Generally speaking, softeners are used in rubber compounds to aid pigment dispersion, to aid processing, and to modify the properties of the vulcanizate, particularly hardness and rebound. In the case of Hycar OR, softeners are also chosen for their tack-imparting properties. Considerably more softener is ordinarily used for a Hycar OR compound than for a similar natural rubber compound. The softener content of a Hycar OR-15 cement compound, for example, may vary from 5 to more than 80 P.H.R., depending upon the type of softener and the type and amount of pigment to be added. The resinous or tarry-type softeners are effective in imparting tackiness to the cement compound and, with the possible exception of cumar, usually exhibit a stabilizing effect on the final cement.

Typical resinous or tarry-type softeners which have been found useful for Hycar OR-15 cements are:

Wood rosins	Nypene resin
K-gum rosin	Coal tars or BRT #7
Ester gums	Cumars
Rezyl resins	"Piccoumaron" resins
Alkyd resins	Cumarone-indene resins
Bakelite resins	Resin R-6-3

Miscellaneous softeners which aid particularly in imparting tackiness are:

Cardolite #816	"Dibutyl meta-cresol"
Advagums	(also increases stability
Shellac	of the final cement)

Another group of softeners is known as the "ester type" group. In this group of materials are usually placed not only the true esters, but other liquids which impart similar physical properties to the synthetic. The "ester type" softeners produce the most pronounced softening action and are used to best advantage in combination with a resinous or tarry-type softener to enhance tackiness and adhesiveness.

Typical members of the ester group are:

[5]Dibutyl phthalate	[6]Tricresyl phosphate
[5]Dibutyl sebacate	[6]Chlorinated tricresyl phosphate
[5]Dicapryl phthalate	[5]Tributoxy ethyl phosphate
[5]Dibenzyl sebacate	[5]Plasticizer SC
[5]Tributyl aconitate	Dibenzyl ether
[5]Diisobutyl adipate	Light coal tar fractions
Dioctyl phthalate	such as Bardol B, etc.

A third interesting group of softeners is composed of comparatively volatile liquids. Such softeners can be used to aid in processing a channel-black cement batch; but when the final cement is used, the softener escapes during the cure, leaving an unplasticized film of exceptionally high tensile strength. Such softeners might be regarded as actual solvents with high boiling points. Representative materials in this group are:

Benzyl alcohol		Triethyl phosphate
Triacetin		Phorone
	Ortho-dichlorobenzene	

In selecting any softener or combination of softeners, oily or waxy materials should be avoided as they will ruin tackiness and detract from general adhesive qualities.

F. Antioxidants. Hycar OR, as manufactured, contains sufficient antioxidant for average uses; however, if additional antioxidant is needed for heat or age resistance it may be added on the mill during mixing. AgeRite Resin and AgeRite Resin D tend to increase tackiness slightly in addition to imparting further age- and heat-resisting properties.

G. Adding Compounding Ingredients on the Mill. Compounding ingredients should be added to the Hycar OR on the mill after the synthetic has been thoroughly masticated, i.e., after 15-30 minutes' milling with continuous cutting. The proper sequence for adding the various ingredients will vary somewhat, depending upon the nature and quantity of the materials to be added. In general the following order of adding the ingredients will be found very satisfactory:

1. Stabilizing agent—if any.
2. Antioxidant.
3. Zinc oxide.
4. Half of total softeners. (If more than one softener is used, they may be blended together before adding to the batch).
5. Half of the pigment. (Hard blacks should be added slowly and evenly).
6. Second half of softener.
7. Second half of pigment.
8. Fatty acid—if any.
9. Accelerator—if any.
10. Sulphur—if any.

H. Sample Compounds.

1. Pure Gum Hycar OR-15 Cement—Low-Temperature-Curing

	Part A	Part B
Hycar OR-15	100.0	100.0
Zinc oxide	2.5	2.5
Sulphur	3.0	...
Butyl Eight	...	6.0
	105.5	108.5

Dissolve each part separately in ethylene dichloride—one pound per gallon of cement. Mix equal volumes just before using.

[5] These materials are effective in lowering the freezing point of Hycar OR compounds which contain them.

[6] These materials have low vapor pressures and are recommended for heat resistance. They also tend to decrease flammability.

2. High-Tensile Channel Black Cement with Volatile Softener—Low-Temperature-Curing

Hycar OR-15	100.0
Zinc oxide	5.0
Benzoic acid	2.0
AgeRite Resin D	2.0
Easy-processing channel black	50.0
Triacetin	30.0
Sulphur	2.5
	191.5

Dissolve in chlorobenzene—1½ pounds per gallon of cement. Just before using, stir into each gallon eight grams of diethylamine followed by fifty grams of carbon disulphide.

3. A Tacky Channel Black Cement—Heat Curing

Hycar OR-15	100.0
Zinc oxide	5.0
Benzoic acid	2.0
Channel black	50.0
Nypene resin	20.0
Dibutyl phthalate	20.0
"Dibutyl meta-cresol"	35.0
Sulphur	2.5
Mercaptobenzothiazole	2.0
	236.5

Dissolve two pounds in a half gallon of chlorobenzene and make up to one gallon with methyl ethyl ketone (preferably anhydrous).

4. A Semi-Active Black Cement—Low-Temperature-Curing

Hycar OR-15		100.0
Zinc oxide		5.0
Semi-active black		75.0
BRT #7		35.0
Dibenzyl sebacate		15.0
Sulphur		2.0
2-mercapto 4, 5-dimethylthiazole	85%	2.0
2-mercapto 2-ethylthiazole	15%	
		234.0

Dissolve two pounds in a half gallon of nitroethane and make up to one gallon with "Solvesso No. 1." Add four grams of butyraldehyde aniline to each gallon before using.

5. A Smooth Soft-Black Exceptionally Stable Cement—Low-Temperature-Curing

Hycar OR-15	100.0
Zinc oxide	5.0
Lauric acid	0.5
P-33 Black	100.0
Tricresyl phosphate	50.0
Sulphur	2.0
2-mercaptobenzothiazole	2.0
	259.5

Dissolve in Sharples dichloropentanes No. 14, 1½ to two pounds per gallon of cement. Add four grams of butyraldehyde aniline to each gallon before using.

6. A White Cement for Adhesions to Fabric—Fast Heat-Curing

Hycar OR-15	100.0
Zinc oxide	5.0
"Silene"	35.0
"Titanox"	35.0
Bakelite Resinoid BR 4036	35.0
Dibutyl phthalate	15.0
Sulphur	2.0
Heptaldehyde aniline	.75
	227.75

Dissolve in methyl ethyl ketone, 1½ pounds per gallon of cement. If slower evaporation is desired, diisopropyl ketone could be used. Other useful cements based on the above recipe may be obtained by replacing the "Silene" with fine white clay. The above type of cement can be made in a multitude of colors by adding colored mineral pigments or dyes to the batch stock during milling.

7. A Red Ebonite Cement—A Protective Coating Preparation for Baking on to Metallic Surfaces, Etc.

Hycar OR-15	100.0
Red iron oxide	90.0
Cadmium selenide	10.0
Tetramethyl thiuram disulphide	2.0
Sulphur	35.0
P-25 Cumar	15.0
	252.0

Dissolve 1½ to 2 pounds in one quart of nitroethane plus one quart of ethylene dichloride; then dilute to one gallon with "Solvesso No. 1." Apply to a clean surface by brushing; dry thoroughly at room temperature or at slightly elevated temperatures; then bake for three hours at 300° F.[7]

Mixed Cements

Cements from Hycar OR lend themselves admirably to blending with other cements, particularly with chlorinated rubber cements. For example, a Hycar OR-15 cement of recommended concentration may be mixed with an equal volume of 10% chlorinated rubber cement made from 125 centipoise chlorinated rubber or with half the volume of a 20% chlorinated rubber solution to produce a very useful blended cement. Such blends can serve four important purposes.

1. Chlorinated rubber has a pronounced stabilizing effect.
2. Chlorinated rubber seems to retard the cure of fast-curing cements during storage, but does not noticeably affect the cure after the cement is spread out in a thin film exposed to air.
3. Chlorinated rubber enhances the adhesion strength of many Hycar OR cements.
4. Chlorinated rubber increases the tackiness of many Hycar OR cements.

Cements made by blending Hycar OR cements with neoprene cements are smooth, tacky mixtures especially useful for bonding cured or uncured Hycar OR to neoprene or *vice versa*.

Cements from Hycar OR may also be blended with Rezyl, Glyptal, and Bakelite resin cements for special uses.

Hycar OR cements do not form stable mixtures when blended with natural rubber cements or cements made from the butadiene-styrene synthetic rubber such as Buna S or GR-S.

Useful cements for special purposes can be prepared from blends of Hycar OR with vinyl chloride resins such as Koroseal. This type of cement can be manufactured by either of two methods. The first method involves mixing a Hycar OR cement with a vinyl chloride resin cement. The second method involves blending Hycar OR and a plasticized vinyl chloride resin on a mill, then, with this blend as the starting material, compounding to produce a cement batch to meet the needs at hand. Solvent generalizations made for Hycar OR hold closely for mixtures of Hycar OR with vinyl chloride resins.

Conclusion

Hycar OR-15 has been found to be one of the more useful and versatile of the synthetic rubbers for use in cement and adhesion work. In this article an attempt has been made to set forth some of the principles of processing necessary for the satisfactory manufacture of cements from this useful industrial material. Solvents have been discussed, and a brief outline of compounding for cements has been given. Short cuts, modifications, substitutions, and improvements will be obvious to those skilled in the art of synthetic rubber compounding and fabrication.

Hycar OR-15 is not a substitute for natural rubber, but is, rather, a specialized synthetic rubber with many properties like natural rubber. It also has outstanding and unalterable differences, the most distinguishing of which are its resistance to solvents, oils, and the diffusion of gases. By the same token, cements made from this synthetic are not substitutes for natural rubber cements, but are, like the parent material, special industrial products which may be used where rubber cements would be totally unsatisfactory.

[7] The seven cement formulations presented above are included solely for purposes of illustration and are not intended as specific cements for specific adhesion problems.

EDITORIALS

Third Phase of the Rubber Program

IN A recent statement Rubber Director Jeffers said that he felt that we had solved the first phase of the rubber program, by providing the means for the production of sufficient synthetic rubber within our borders, but that much more than is tangible at first glance—is dependent upon our successfully surmounting the obstacles in the second phase. The second phase may be described as that period upon which we are now entering when an appreciable tonnage of synthetic rubber will actually be produced, and the problem is to use it to the best advantage. Without trying in the least to detract from the importance of the satisfactory and early solution of the second phase, it would appear to be not too early to give some attention to a definite solution of the third phase—that period after the war when rubber will be available for consumption in amounts considerably in excess of 2,000,000 long tons a year.

During the past year work has been progressing in various branches of the industry under the direction of the Office of the Rubber Director on the best means of compounding and processing the major synthetic rubbers to be produced in the government plants, and information summarizing this work has been made available to all manufacturers. Rubber products will be made from these synthetic rubbers in increasing amounts during the remainder of 1943 and in 1944, and the amount of additional "know how" that will be learned should be in proportion to the greater tonnage of synthetic rubbers to be used. Already the rate of the increase of knowledge in the compounding, processing, and building of tires from GR-S during the last 30 months is phenomenal when compared with the rate of increase of our knowledge for the manufacture of tires from natural rubber during the last 30 years.

Granting that our production of synthetic rubbers reaches an annual rate of 850,000 long tons within the next year and considering the possibility that within the next two years an equal or greater tonnage of natural rubbers may become available, what will be the equilibrium value for the annual consumption of all types of rubbers after the forces which will influence the total consumption have exerted their maximum effect? The general consensus of opinion seems to be that synthetic rubbers will have difficulty competing with natural rubbers on purely economic grounds, when and if both are available in practically unlimited amounts. The opinion recently expressed by John L. Collyer, president of The B. F. Goodrich Co., and Harry L. Fischer, director of research of the U. S. Industrial Alcohol Co., that continued operation after the war at least on a limited basis of facilities for the production of 150,000 to 250,000 tons a year, even if the extra cost had to be absorbed by the government, would seem to be the first decision to be agreed on for the postwar period. This extra cost would be just as logical as the extra cost we will undoubtedly accept for the maintenance of our Armed Services on a larger scale after this war than at any time previous in our history in order to insure national security and aid in maintaining world peace.

It is also very probable that the achievement of crowding ten years' work into two in the design, construction, and operation of our synthetic rubber plants may be paralleled by similar achievements in providing new and cheaper materials and methods for the production of synthetic rubbers and better and better methods of using them so that within the next two years natural and synthetic rubbers may be able to meet on more nearly equal terms on an economic basis. These efforts with synthetic rubbers may result in our obtaining an even better knowledge of the fundamental properties of natural rubbers, since in the production of "man-made" rubbers we can vary the materials and methods almost at will, and the properties of the finished product can be evaluated to a much greater extent. This leads to the realization that with the transition of the rubber industry into one that has more the aspect of a chemical industry, the market for its products and the scope of its activities will be increased many times.

Therefore one of the most important decisions to be arrived at in planning for the third phase of the rubber program is to see to it that everything possible is done to provide for the use of all types of rubbers on a scale never before realized in the rubber industry. Will there be a market for such an expansion in the production of rubber goods to a level more than double that of the prewar years?

In a recent study by the United States Department of Commerce entitled, "Markets After the War—An Approach to Their Analysis", it is stated that the latent purchasing power of present high incomes may be still available, if as a result of long-range planning, business and government can successfully bridge the immediate reconversion period until civilian goods start rolling off the assembly lines again. In this same study a postwar projection of probable demands, although hypothetical, is useful in indicating what might be expected in those fields in which rubber is required either wholly or in part. Using figures for the year 1940 as a base, the percentage increase in 1946 in the demand for replacement tires and tubes is 69%, for passenger-car replacement parts and accessories, 82%, for shoes and footwear, 65%, for aircraft, 35%, and for residential and other building, more than 200%.

The raw material, the manpower, the market will all be available, and with sufficient planning and courage the third phase of the rubber program should be one in which the new rubber industry will contribute a real part to the solution of postwar problems and obtain the desired share of postwar profits. The war is still to be won, but rubber for that purpose seems now to be assured. The next problem will be the use of the great supply of postwar rubber to help win the peace.

What the Rubber Chemists Are Doing

A. C. S. Rubber Division Activities

Papers on Kem-Pol, Butyl, and Buna S at New York Meeting

SOME of the latest developments with two different synthetic rubbers and a new rubber substitute were given in papers before the New York Group, Division of Rubber Chemistry, A. C. S., at the meeting at the Building Trade Association Clubrooms, 2 Park Ave., New York, N. Y., June 11. Because of present-day conditions, this technical meeting took the place of the usual summer outing. About 350 members and guests were present to hear the papers, but about 225 remained for dinner and the entertainment which followed. The meeting was presided over by John Ingmanson, of Bell Telephone Laboratories, Inc., the Group chairman. Present also were John T. Blake, the Rubber Division chairman, H. I. Cramer, Division secretary, and Bert Weatherbee, chairman of the Buffalo Group.

W. C. Walton, research chemist of the Sherwin-Williams Co., gave a good deal of information on the various grades of Kem-Pol with respect to the use of this rubber-like material as an extender or replacement for natural and major synthetic rubbers. The properties of three polymers, #14, #54, and #11, ranging from a viscous liquid to a tacky semi-solid, and of a pre-cured polymer, #11-41 MP, obtainable in the form of a dry solid were described. Departures from the regular compounding and curing procedures in the handling of the first three polymers are the necessity of using an internal mixer for the addition of at least some of the compounding ingredients followed by a "baking" of the mixture at about 250° F. in air, after which it can be handled on an open mill. A cure of 25 to 40 minutes at 287° F. was recommended. Physical properties of the Kem-Pols compounded with soft furnace and channel blacks were shown and also some data on chemical and solvent resistance. As an extender for GR-S, these polymers were indicated as useful to improve tack and smoothness without too great an effect on physical properties. Comparative mixes using factice, an alkyd resin, and Kem-Pol showed advantages for the latter in lower plasticity, somewhat better processing than the resin, better oxygen and oven aging, and better tear resistance. The use of the Kem-Pol polymers for solution and emulsion adhesives was also described.

I. E. Lightbown, of Stance Distributors, Inc., talked on the "Present GR-I (Butyl) Rubber Situation." After a bit of discussion of the history of the development of Butyl rubber which was given in a humorous vein, the speaker changed to a report on the compounding and processing of what is now known as GR-I coming from the government-owned plants. It was emphasized that GR-I contains no other non-polymer materials than 0.5 part of anti-oxidant and some zinc stearate on the surface to prevent sticking. It is being delivered at a plasticity suitable for compounding, and no breakdown is required; in fact it should not be removed from the cardboard container prior to mixing because of the fact that the present uncompounded polymer has an appreciable cold flow. The use of a Banbury with a batch size somewhat greater than for natural rubber and rapid mixing were recommended. If no Banbury is available, an apron mill should be used. Calendering and extruding should present no difficulties, but it was again emphasized that compounding ingredients containing aliphatic unsaturation should be eliminated, and that mixtures of GR-I with natural rubber, GR-S, and GR-M (neoprene) were not possible. Slides were shown to illustrate the properties of compounds loaded with various carbon blacks and other fine particle-size fillers, and representative formulas for the use of GR-I in tires, tubes, insulation, and mechanical goods were given.

Joseph Breckley, of Titanium Pigment Corp., was the final speaker, who presented a paper on "Some Observations on the Flex-Cracking Characteristics of Buna S Compounds" in which pigment "X" was shown to have a beneficial effect on the flexing of tread compounds when used in combination with carbon blacks. The De Mattia machine was used, and the test pieces were pierced with a steel pin in the center of the grooved surface to produce a hole 0.025 inch in diameter and 0.05 inch deep. The tests were conducted at 100° C. because of the greater brittleness of the GR-S at that temperature, and crack growth extending from this hole was quite uniform, and the results obtained were reproducible to a surprising degree. Compounds having a flex life of only 7,500 were found to last for 100,000 flexes after the addition of pigment "X", which was revealed as being any good grade of hard clay.

Furnas Talks at Buffalo

THE spring meeting of the Buffalo Group, Division of Rubber Chemistry, A. C. S., was held at the Hotel Touraine on May 27 with about 65 members and guests present. An informal reception for the speaker of the evening, C. C. Furnas, of the Curtiss-Wright Corp., preceded the meeting. Dr. Furnas has had an exceptionally wide and varied background, having been associated at various times with the United States Bureau of Mines, U. S. Steel Corp., and Yale University. He is also an author of note and has just served as the editor of "Roger's Manual of Industrial Chemistry", sixth edition. Since early in 1943, Dr. Furnas has been establishing a research laboratory at the Curtiss-Wright Corp. plant in Buffalo, where problems of the next five or ten years will be concentrated on.

In his talk, "The Next 25 Years", the speaker indicated the tremendous improvements to be expected in the production of articles for the three great essentials: food, clothing, and shelter, and promised revolutionary developments with abundances such as has never before been known. In connection with the use of our natural resources, he pointed out that although we may be approaching the exhaustion of the great Mesabi iron range in Minnesota, if we are willing to produce iron from deposits containing 35 instead of the 50% in the Mesabi range, the amount of iron available for the future is practically unlimited. In discussing the problems of the airplane manufacturers, Dr. Furnas said that true helicopters, such as the Sikorsky model, will undoubtedly become as popular as higher priced automobiles, with speeds of 150 miles per hour and running costs about equal to present-day autos. During the next 25 years, speeds above sonic levels will be increasingly important since air transportation must survive on the basis of its one predominant characteristic—speed. Considerable discussion followed Dr. Furnas's talk.

The next meeting will be held some time in September, depending on the date of the A. C. S. Rubber Division meeting to be held in New York.

L. A. Group Meeting

THE eighty-sixth meeting of the Los Angeles Group, Division of Rubber Chemistry, A. C. S., was held June 1 at the Mayfair Hotel, Los Angeles, Calif., with more than 100 members and guests present. In the absence of Chairman C. Roese and upon the invitation of A. L. Pickard, former Chairman Garvin A. Drew presided. Routine committee reports were given before the speaker of the evening talked.

He was the Rev. Ralph L. Phillips, founder and manager of the Phillips Missions of the Orient, and he was introduced by his friend, Group Member T. Kirk Hill. Dr. Phillips covered various phases of the war in China and in the Philippines. Later he showed motion pictures which he had taken in China during hostilities.

The meeting concluded with the drawing for prizes. A. O. Collier won the Ice Thermos donated by John Hoerger, of A. Schrader's Son; while two carving knives, gift of James C. Clarke, of Williams-Clarke Co., went to Ben Kirk, of Goodyear Tire & Rubber Co., and Lewis E. Long, of Wagner Electric Corp. The door prizes, $3.75, $5, and $10 in War Stamps were won by C. M. Reinke, Arthur McMurray, and Charles Kuhn, respectively. Messrs. Reinke and Kuhn contributed their prizes to the South China Relief Society through Dr. Phillips.

The Los Angeles Group will hold its

usual annual summer outing at the Uplifters Club, Santa Monica, July 24-25. A. L. Pickard, of Braun Corp., is chairman of the affair.

Butyl before Chicago Group

THE Chicago Group, Division of Rubber Chemistry, A. C. S. held its final meeting of the season on June 4 in the Morrison Hotel, Chicago, Ill. The speaker was G. A. Taylor, of Stanco Distributors, Inc., whose subject was "Compounding and Processing Butyl Rubber." Mr. Taylor compared Butyl rubber to natural rubber, not only in respect to compounding and processing characteristics, but also to the properties of the final vulcanizate. He brought out the fact that although Butyl rubber closely paralleled natural rubber in a great many respects, it had certain properties, such as impermeabilty to gases, resistance to sun checking, etc., in which it was far superior to natural rubber.

As this was also the annual business meeting of the Chicago Group, the election of officers for the coming year was held, resulting as follows: chairman, E. T. Meyer (Herron & Meyer); vice chairman, B. W. Hubbard (Ideal Roller & Mfg. Co.); secretary-treasurer, F. Frost, Jr. (Frost Rubber Works); executive committee, R. T. Kinsley (Dryden Rubber Co.), D. Seifer (Diamond Wire & Cable Co.), H. I. Houlette (Inland Rubber Corp.), W. F. Bernstein (Victor Mfg. & Gasket Co.), S. L. Weller (E. I. du Pont de Nemours & Co., Inc.), J. P. Sheridan (New Jersey Zinc Sales Co.), M. C. Vaughan (Wishnick-Tumpeer, Inc.), S. A. Davis (C. P. Hall & Co.).

The Group also passed an amendment to its constitution, increasing the annual dues from $1 to $2.

The Chicago Group will hold a golf outing some time this summer.

Boston Group Outing

THE summer meeting of the Boston Group, Division of Rubber Chemistry, A.C.S., was held at the Commonwealth Country Club on June 25. As the scheduled speaker, Walter H. Peterson, who was to have discussed "Conversion to Synthetics" as a feature of the evening's program, was detained in Washington, and no substitute was available, the entire program was devoted to sports, enjoyed by the 250 who attended the affair.

Winners of the various events follow: *golf tournament: kickers handicap*, R. Cowen, M. Wilner, and R. Edwards; *low gross*, J. Simpson, H. O'Dell, J. Salamon; *nearest pin*, E. Colligan; *low net*, R. H. Heintz; *most 8's*, J. Clarke; *highest score*, E. D. Covell; *horseshoes*: R. Patterson; *ping-pong*: T. Emery, T. Cushman; *darts*: E. V. Osberg. Directors supervising the various activities included: E. Colligan, golf; R. Huber, cards; W. C. Weller, darts and archery; and H. Liddick, ping-pong. The committee in charge of the outing consisted of: L. R. Clarke, group chairman; J. L. Haas, vice chairman; H. A. Atwater, secretary-treasurer; J. R. Geenty, D. Wright, and L. D. Ackerman, of the executive committee; and Messrs. Weller, Liddick, Colligan, and Huber.

Prizes were awarded through the generosity of the following contributors:

L. Albert & Son, American Cyanimid & Chemical Corp., American Zinc Sales Co., Inc., Anaconda Sales Co., Ansbacher-Siegle Corp., T. C. Ashley & Co., Atlantic Refining Co., Avon Sole Co., M. Barbanell, Inc., Barrett Co., B. B. Chemical Co., Binney & Smith Co., Godfrey L. Cabot, Inc., Callaway Mills, Carbide & Carbon Chemicals Corp., Carter Bell Mfg. Co., Cleveland Liner & Mfg. Co., Colonial Beacon Oil Co., Commercial Solvents Corp., Continental Carbon Co., Converse Rubber Co., Deecy Products Co., E. F. Drew & Co., Inc., E. I. du Pont de Nemours & Co., Inc., Eagle-Picher Sales Co., William D. Egleston Co., C. E. Gale Co., General Atlas Carbon Div. of General Properties Co., General Dyestuff Corp., General Latex & Chemical Corp., General Fibre Co., Guivaudan-Delawanna, Inc., Haartz-Mason-Grower Co., Alfred Hale Rubber Co., Hercules Powder Co., Hird & Connor, Inc., Hodgman Rubber Co., Hood Rubber Co., J. M. Huber, Inc., Ralph B. Huber, Hycar Chemical Co., INDIA RUBBER WORLD, Innis, Speiden & Co., Imperial Paper & Color Corp., Ernest Jacoby & Co., D. H. Litter Co., Inc., Malrex Chemical Co., Monsanto Chemical Co., Moore & Munger Co., H. Muehlstein & Co., New Jersey Zinc Co., A. C. Nispel, Inc., Oakite Products, Inc., Odell Coated Fabrics, Panther-Panco Rubber Co., Pequanoc Rubber Co., Philipp Brothers, Inc., Pittsburgh Plate Glass Co., Plymouth Rubber Co., Raffi & Swanson, Inc., Respro, Inc., Rex-Hide, Inc., John Royle & Sons, *The Rubber Age*, Sanford Mills, A. Schraders Son Co., A. Schulman, Inc., Henry L. Scott Co., Sessions-Gifford Co., Sherwin-Williams Co., Socony-Vacuum Oil Co., Stamford Rubber Supply Co., Stanco Distributors, Inc., Standard Chemical Co., Standard Lime & Stone Co., Standard Ultramarine Co., Stanley Chemical Co., Stowe-Woodward, Inc., Sun Oil Co., Taylor Instrument Cos., Texas Co., Thickol Corp., Thompson Weinman Co., Titanium Pigment Co., Wm. R. Thropp & Sons Co., Turner-Halsey Co., Tyer Rubber Co., Union Bay State Co., R. T. Vanderbilt Co., Vansul & Co., Weller Chemical Co., Wesco Waterpaints, Inc., L. G. Whittemore, Inc., Wilmington Chemical Corp., Charles T. Wilson Co., Inc., N. S. Wilson & Sons, Windsor Mfg. Corp., Wishnick-Tumpeer, Inc., Xylos Rubber Co.

Rubber Division Fall Meeting

THE fall meeting of the Division of Rubber Chemistry, A. C. S., will be held at the Hotel Commodore, New York, N. Y., on Tuesday, Wednesday, and Thursday, October 5, 6, and 7, with a banquet on Wednesday evening if the existing situation permits. Schedules for the presentation of papers and the other details connected with the meeting are being arranged by a committee appointed by John T. Blake, chairman of the Division, and consisting of E. B. Curtis, R. T. Vanderbilt Co., chairman; John H. Ingmanson, Bell Telephone Laboratories; Walter J. Geldard, United States Rubber Co.; Harry E. Outcault, St. Joseph Lead Co.; Charles R. Haynes, Binney & Smith Co.; Peter P. Pinto, *The Rubber Age*; and B. B. Wilson, INDIA RUBBER WORLD. Full information regarding the complete program, hotel accommodations, etc., will be mailed to members and published at an early date.

James Discusses Guayule

THE regular monthly meeting of the Northern California Rubber Group, held May 27 at the Hotel Claremont, Berkeley, Calif., attracted an audience of 44, who heard Robert James, rubber technologist at the Mare Island Rubber Laboratory, treat the subject of guayule. His talk, illustrated with slides, covered the culture and processing of the plant. Mr. James also answered questions on guayule rubber, which has been his specialty for a number of years.

Next Vic Vodra, of R. T. Vanderbilt Co., who had attended the recent meeting of the Division of Rubber Chemistry, A. C. S., in Detroit, reported highlights of the convention, with emphasis on synthetic rubber.

The Vanderbilt company donated the door prize ($7.50 in War Stamps), won by Kenneth Marple, of Shell Development Co.

Goldenrod Planting for Rubber

EXPERIMENTAL plantings of goldenrod totaling 650 acres were completed this spring by the United States Department of Agriculture, Washington, D. C., as part of the 1943 emergency rubber program, authorized by Rubber Director Wm. M. Jeffers. The Forest Service planted four selected strains of goldenrod on about 550 acres in the vicinity of Waynesboro, Ga. Small experimental plots of two to ten acres were planted by the Bureau of Plant Industry, Soils, and Agricultural Engineering in South Carolina, Alabama, Mississippi, Louisiana, Texas, and California.

Contracts have been signed with farmers for preparing the fields and cultivating the unique crop. Special agricultural machinery, developed for goldenrod production by the Bureau of Plant Industry, is being tested on a large scale.

Threefold purpose of the planting program is to determine the best locations, soil types, and methods for growing rubber-producing goldenrod; to obtain more complete information on possible yields; and to harvest a supply of goldenrod for testing extraction methods, and the properties and uses of the rubber product.

The late Thomas A. Edison conducted extensive experiments with goldenrod[1] as a rubber source and selected, for cultivation, certain strains which showed greater rubber content than the numerous wild species. After his death in 1931 the records of his experiments were turned over to the Department of Agriculture.

Goldenrod does not require the use of nurseries for propagation. It may be planted directly in the field in the spring and harvested in the fall. Only the leaves of the plant are used in processing for rubber. They may be processed immediately or stored for processing later. This year's leaf harvest will be sent to the Department's Southern Regional Research Laboratory at New Orleans for further extraction and utilization studies. In the present experimental growing operations every effort will be made to produce a maximum quantity of planting stock, in case a larger program should prove desirable next year.

Administration of the field project, assigned to the Forest Service, is under the direction of Regional Forester J. C. Kircher, with headquarters at Atlanta, Ga. Research phases of the project are handled by the Agricultural Research Administration.

[1] See INDIA RUBBER WORLD, Feb. 1, 1930, p. 55.

UNITED STATES

United States Rubber Co.

Jesse H. Jones, F. B. Davis, Jr., and Wm. M. Jeffers Inspecting, on June 11, Synthetic Rubber Produced at the Institute, W. Va., Plant

Officials Inspect Synthetic Plants; Prices to Manufacturers Lowered

During the latter part of May and the first part of June a tour and inspection of synthetic rubber and aviation gasoline plants were made by Under-Secretary of War Robert P. Patterson; Under-Secretary of the Navy James V. Forrestal; Ralph K. Davies, Deputy Petroleum Administrator for War; and Rubber Director William M. Jeffers. This joint inspection, planned after the clash between Mr. Patterson and Mr. Jeffers in April, had as its purpose the observation of equipment that had been built and also was an attempt to see where and how the programs for synthetic rubber and aviation gasoline actually were in conflict. In a joint statement issued at Baton Rouge, La., these government officials said that one-third of the government's synthetic rubber plant construction program had been completed, one-half of the aviation gasoline plants needed were in operation, and that the naval escort vessel program was proceeding at a satisfactory rate. In separate statements Mr. Jeffers and Mr. Patterson said that there should be no further need of disagreement on rubber and aviation gasoline production plans. The butadiene and GR-I (Butyl) rubber plants of the Standard Oil Co. of La. and the GR-S (Buna S) plant of Copolymer Corp. at Baton Rouge were visited as well as other plants in Louisiana and Texas.

Office of War Mobilization Created

At about the same time as the above government executives were working out their difficulties in the field by an actual inspection of the plants being built, James F. Byrnes was named head of a new top agency, Office of War Mobilization, to be the means of keeping our essential civilian economy running at high speed and to put an end to inter-agency quarrels. It will be recalled that it was Mr. Byrnes who finally settled the various conflicts between WPB and Chairman Donald Nelson, the Army, the Navy, and Mr. Jeffers early this year in connection with priority ratings for synthetic rubber and aviation gasoline plants. An executive order gave Director of War Mobilization Byrnes powers exceeding those previously given WPB Chairman Nelson.

Mr. Jeffers on June 7 expressed his deep appreciation of an announcement that President Vargas of Brazil had declared the month of June to be "Rubber Month" in that country. In a message to Jefferson Caffrey, American Ambassador to Brazil, the Rubber Director pointed out that every pound of natural rubber was of vital importance to the war effort of the United Nations.

Prices of GR-S and GR-I to Rubber Manufacturers Down

Rubber Reserve Co. Circular No. 21[1] (May 31) sets the price of GR-S rubber to manufacturers of rubber products at 18½¢ a pound and the price of GR-I rubber at 15½¢, considerable reductions from the prices of 36 and 33¢, respectively, announced in Circular No. 17 on April 7, 1943. But it was revealed that Rubber Reserve Co. would still actually receive the 36- and 33-cent price by virtue of a type of subsidy, the idea for which seemed to have originated with the War Department. In a letter to the Comptroller General of the United States, dated May 28, Secretary of War Stimson pointed out that the higher prices of natural, GR-S, and GR-I rubbers of 40, 36, and 33¢ a pound, respectively, effective June 1, 1943, according to Circular No. 17 would create serious procurement problems for the War Department because of the necessity of amending numerous contracts and subcontracts based on a price of 22½¢ a pound for natural rubber. The War Department had concluded that the maintenance of stable prices for natural and synthetic rubber to rubber manufacturers would facilitate the prosecution of the war and had worked out an arrangement with the Office of the Rubber Director, the Rubber Reserve Co., the Navy Department, and the Office of Price Administration which was submitted to the Comptroller General for approval in order to make certain that appropriations of the War Department might be properly charged in accordance with the terms of the proposed agreement. Under this agreement, Rubber Reserve would supply rubber manufacturers for use in filling "War Orders" natural and the two major synthetic rubbers at the former price of 22½¢ a pound for natural rubber and equivalent prices for the synthetic rubbers, and the War and other government departments purchasing rubber products for war use would pay Rubber Reserve Co. the difference between the amounts paid by the rubber manufacturers and the new higher prices fixed by Rubber Reserve. The agreement was approved, and Circular No. 21 was issued by Rubber Reserve Co. The price of GR-S and GR-I for use in essential civilian products would be at the 18½- and 15½-cent level without any further payment to Rubber Reserve. No price for GR-M (Neoprene GN) for essential civilian uses has as yet been announced. The new system was viewed with satisfaction by rubber manufacturers since it would avoid waste of manpower in unnecessary paper work.

Many Executives Visit Institute, W. Va., Plant

An inspection was made on June 11 of the huge government owned synthetic rubber plant at Institute, W. Va., being oper-

[1] See pp. 384-85.

CALENDAR

July 24-25.	Los Angeles Rubber Group. Summer Outing. Uplifters Club, Santa Monica, Calif.
Aug. 8.	Northern California Rubber Group. Summer Outing.
Sept. 6-10.	A.C.S. Fall Meeting. Pittsburgh, Pa.
Sept. 23-24.	SAE. National Tractor Meeting. Schroeder Hotel, Milwaukee, Wis.
Sept. 30-Oct. 3.	SAE. National Aircraft Engineering and Production Meeting. Biltmore Hotel, Los Angeles, Calif.
Oct. 5-7.	Rubber Division, A.C.S., Fall Meeting. Commodore Hotel, New York, N. Y.
Oct. 5-7.	National Safety Council. 32nd National Safety Congress and Exposition, Chicago, Ill.
Dec. 6-11.	Nineteenth Exposition of Chemical Industries. Madison Square Garden, New York, N. Y.

ated by the Carbide & Carbon Chemicals Corp. and the United States Rubber Co., by many leading government officials and industry executives interested in the rubber program. Secretary of Commerce Jesse H. Jones; Senators Guy M. Gillette, Harry S. Truman, and Harley M. Kilgore; Gen. Wm. N. Porter, chief of the Chemical Warfare Service; Rubber Director Jeffers; Harvey S. Firestone, Jr.; Paul W. Litchfield; F. B. Davis, Jr.; Herbert E. Smith, and many others were among those present. In a statement broadcast from the plant Mr. Jones stated that there had never been any doubt in the mind of the President or of industry that we could produce synthetic rubber in large quantities within a reasonable time, and he had shared this view. The Secretary complimented Mr. Jeffers on his devotion to his responsibilities and read a letter from the President which stated that all who had part in the manufacture of synthetic rubber had a just cause to feel that they were making a real contribution to the war effort.

At a dinner in the evening given by the Chamber of Commerce of Charleston, W. Va., Mr. Jeffers said that we were beginning to see the end of the first phase of the difficult rubber problem. He stated that we are assured of enough base rubber to care for the military needs of ourselves and our Allies and at least essential civilian requirements. This does not mean that we can become too optimistic about our rubber, he declared further, because we have only solved the first phase, and much more than is tangible at first glance, is dependent upon our successfully surmounting the obstacles in the second phase. The problems of fabricating this synthetic rubber are not a simple task, and it is not possible to relinquish restrictions for rubber conservation very far as yet. Mr. Jeffers expressed his appreciation of the words of praise from Bernard Baruch, which in the form of a letter to the Rubber Director had also been read at the ceremonies.

Other Rubber Industry Developments

An announcement by Governor Coke R. Stevenson of Texas set June 28 aside to celebrate the part that state is playing in the solution of America's rubber problem. Special ceremonies will be held at Houston at which Secretary Jones and Mr. Jeffers will participate. The event will be featured by the formal opening of the government-owned GR-S plant to be operated by the General Tire & Rubber Co. and the General Latex & Chemical Co. William O'Neil, president, L. A. McQueen, and T. S. Shore, vice presidents, will represent General Tire & Rubber, and Stuart Hotchkiss, chairman of the board of General Latex, and Warren MacPherson and Kenneth Osborn will be the representatives for that company. In addition, H. C. Wiess, president, will represent the Humble Oil & Refining Co. from whose adjoining plant the butadiene for the production of GR-S will be obtained.

Preliminary production of butadiene at the government-owned butadiene and styrene plants to be operated by the Koppers Co. at Pittsburgh, Pa., was also announced during the month. It is also probable that the one of the largest butadiene plants to be operated by the Neches Butane Products Co., Port Neches, Tex., will get into production early in July.

It was reported last month that the WPB had made commitments for high-tenacity rayon yarn for tires for 1944 to the extent of 174,000,000 pounds, 32,000,000 pounds short of the amount requested by the Rubber Director in behalf of the Army, Navy, and other government claimants. In this connection the Industrial Rayon Corp. announced substantial capital expenditures for expansion of facilities for the production of this type of rayon yarn in its plants in northern Ohio under WPB allocation.

Rubber Director Jeffers also was a member of a party of officials of Canada and the United States who inspected a new industrial alcohol plant developed by the Ontario Paper Co. at Thorold, Ont., June 18. This plant makes use of waste liquor from the manufacture of paper by the sulphite process for the production of alcohol. The alcohol results from the action of yeast on fermentable sugars in the waste sulphite liquor, and the process, although used in Europe since 1936, had never before been used in the Americas.

Late last month in response to numerous queries concerning the continued operation of his office, the Rubber Director issued a statement by which it became known that Mr. Jeffers and top members of his organization have mutually agreed to remain at their posts until no doubt remains that the rubber problem has been solved and can be carried on without the necessity of maintaining a separate organization in Washington.

Rubber Restrictions Revised as Nine Orders Are Consolidated

Relaxing certain restrictions on the allocation and use of synthetic rubber, and at the same time tightening control over the nation's dwindling stockpile of crude rubber, the Office of Rubber Director on June 18 issued R-1, a new, comprehensive order designed to clarify and supersede nine previously issued orders relating to the consumption of rubber, synthetic rubber, and balata, and the delivery, acquisition and use of products thereof. The superseded supplementary orders are: M-13, M-15-b, M-15-b-1, M-15-d, M-15-e, M-15-f, M-15-g, M-15-h, and General Preference Order M-46. These nine orders were all revoked effective July 1.

Basically R-1 will control the following operations within the rubber industry and is designed to accomplish these results:

1. It relaxes restrictions on certain types of synthetic rubber: Buna S, Butyl, and neoprene, which are referred to as general-purpose synthetics because they are suitable for substitution in the place of crude rubber. Under previous orders no synthetic rubber could be consumed except upon specific authorization. Under Rubber Order R-1, however, general-purpose synthetics are administered in the same manner as crude rubber and latex under the superseded orders. The distribution of the remaining types of synthetic rubber (referred to as special-purpose synthetics) is handled in the same manner as the distribution of all synthetic rubber under previous orders.

2. The manufacturers' allocation of rubber and general-purpose synthetics can be used for making a wider variety of civilian products than heretofore. Under M-15-b the manufacturers' over-all quota of raw material was broken down into separate allocations for various groups of products appearing on the permitted lists. Under R-1 many of these groups have been thrown into larger groups, thus permitting the manufacturer to use his allocation of rubber and general-purpose synthetics for the manufacture of a wider selection of goods.

3. Under R-1 the use of synthetic rubber for experimental purposes has been encouraged by a provision which obviates the necessity of obtaining authorization for such use.

4. The complex system of product schedules in M-15-b, and the list of manufacturing regulations in M-15-b-1, have been considerably revised and simplified. Many products, previously permitted on appeal, in exceptional circumstances, have now been added to the list of permitted products. Manufacturing regulations (compounding formulas) have had to be changed to reflect the increasing production and subsequent processing of synthetic rubber.

5. The definitions have likewise been revised. New definitions have been added, including, particularly, definitions of synthetic rubber, general-purpose synthetics, and special-purpose synthetics. The definition of scrap rubber product has been enlarged, opening up for public use tires which may be made serviceable by insertion of reliners or the affixing of temporary patches. These tires were formerly classed as scrap rubber and as such could not be sold to the public.

6. The restrictions in orders M-15-d (distribution of airplane tires and tubes), and M-15-g (distribution of industrial power truck tires and tubes) have been done away with entirely. It is expected that the tire and tube inventory restrictions which have been added to R-1 will sufficiently curtail the acquisition of these products so that PD forms will be unnecessary. While inventory restrictions have been retained on stocks of raw material, new restrictions have been imposed upon tire and tube inventories of manufacturers, dealers, original equipment manufacturers, and industrial consumers of replacement tires and tubes.

7. End product restrictions on the use of cement and the sale and acquisition of life-saving suits and gloves (formerly contained in orders M-15-f, M-15-e, and M-15-h, respectively) have been carried over in R-1 in more simplified form.

Reasons for the issuance of R-1, as described by the Office of Rubber Director, follow:

Because of the dwindling stockpile of crude rubber it will be necesary to main-

tain an even tighter control over this material. This control is primarily exercised by reduced allocations and restrictions on the rubber content of goods manufactured. At present, as the percentage of crude rubber allocated is being reduced, the percentage of general-purpose synthetics allocated is being increased. The point has not yet been reached, however, when we can dispense with controls over synthetics. It is contemplated that as soon as synthetic rubber is available in sufficient quantities, controls over synthetics will be relaxed as rapidly as possible. This can be accomplished by increased allocation, opening up of the regulations relating to the compounding of synthetic rubber. However, as the stockpile of crude rubber diminishes, even tighter control of this raw material will be necessary.

Shoe manufacturers' attention has been especially called to R-1 under which they are permitted to use rubber cement for additional operations including: joining materials to make an insole or outsole, wood heel covering and platform binding, and cementing heel pads, sock-linings, and inner shoe cushions and pads. This action, however, does not mean a greater amount of cement will be available, but it gives manufacturers a wider choice of operations to use available cement to the best possible advantage. Manufacturers are also urged to conserve rubber cement by every means possible.

Recent Data on Revoked Orders

Amendment 3 (June 3) to Supplementary Order M-15-b as amended April 13, 1943, clarifies definitions in the order, to add the following terminology to paragraph (a) (17) (i):

"The term does not include any contract or purchase order for

"(a) maintenance, operating, or repair material or equipment to be delivered to or for the account of any federal government-owned or controlled plant or facility which is not operated by the federal government * * * "

The words "maintenance, operating, or repair" are inserted to qualify the words "material or equipment" to make it clear that the term "war order" does not include any contract or purchase order for material or equipment to be delivered as specified, other than maintenance, operating, or repair material or equipment. The words "plant or facility" are substituted for the word "corporation" because it has been found that some federal government-owned or controlled plants or facilities—such as ordnance plants—are not incorporated, and it is desired to exclude deliveries to them or for their account whether they are incorporated or not.

Amendment 4 (June 8) to M-15-b authorizes withholding "scrap" tires that can be made reusable by the application of patches and other repairs, in addition to the use of reliners. This order follows the recent one authorizing the withholding of scrap tires that would otherwise have gone to reclaiming plants, but that could be made reusable by the addition of reliners alone. It was found that these potentially reusable carcasses, known to the trade as "twilight" tires, totaled many thousands. Therefore the language used in Amendment 2, issued May 20, "Tires which can be made serviceable by the insertion of a reliner" would not accomplish the desired end. It has become apparent that "twilight" tires will require also patches and other repairs. "Twilight" tires may be described as used tires which, when temporarily or permanently repaired, may still be used for the primary purposes for which designed.

The tire situation is so critical that every used tire susceptible of temporary or permanent repair, or retread, for use as a tire, is required to be made available as soon as possible. Defense Supplies Corp. has a large supply of used tires, a substantial number of which can be disposed of as "twilight" tires if the definitions of "scrap rubber products", "repairable tire", and "treadable tire" are altered as set out in Amendment 4.

Other WPB Orders

Allocation Order M-183 — Phosphate Plasticizers—was amended May 24 to include under its terms diphenyl mono-(ortho xenyl) phosphate and di- (ortho xenyl) mono-phenyl phosphate.

Allocation Order M-275—Alkanolamines—was extended May 25 to cover also diethylethanolamine.

Allocation Order M-326, issued June 8, restricts the use and delivery of cellulose ester flake; while Supplementary Allocation Order M-326-a relates to cellulose ester sheets, rods, tubes, and molding powder.

Urea and melamine aldehyde resins and molding compounds have been placed under allocation control through the issuance of Allocation Order M-331, effective July 1.

Also under allocation control are glycol ethers (Allocation Order M-336, effective June 22).

Conservation Order M-328, issued June 1, covers restrictions on preference ratings for textiles, clothing, leather, and related products.

Oils for protective coatings have been put under WPB control by Conservation Order M-332, effective July 1.

The acetic esters of butyl alcohol, including normal butyl acetate, secondary butyl acetate, and isobutyl acetate, have also been placed under allocation in a revision of General Preference Order M-159—Butyl Alcohol—(May 26).

Methyl isobutyl ketone, or "hexone", on June 1 was placed under the control of the WPB by General Preference Order M-322.

General Preference Order M-327 (June 7) curtails delivery and use of ethyl acetate and isopropyl acetate.

Amended Limitation Order L-239 and Limitation Order L-304, effective June 22, rigidly control the manufacture of paperboard boxes and wrappers for a wide variety of uses including the packaging of rubber heels and sporting goods.

To implement the farm machinery and equipment requirements of the War Food Administration program the WPB released Limitation Order L-257—Farm Machinery and Equipment and Attachments and Repair Parts Therefor—effective July 1, which cuts short the life of its predecessor, L-170, by three months. Production quotas under the new order are based on actual needs, and also allowed is a higher percentage for the production quotas of small producers. However the manufacture of any farm machinery and equipment requiring rubber tires is subject to written authorization of the WPB. L-257-a, which relates to exports of farm machinery and equipment, prohibits from July 1, 1943, through June 30, 1944, export of any such item requiring rubber tires, except upon written approval of the WPB.

Simplification of dial pressure gages and regulators by the WPB on May 29 is expected to raise production of these items 15% to 25% and to expedite the "must" programs in which these instruments are used. Schedules IV and V, simplifying gages and regulators, respectively, are added to Order L-272, which governs production of control valves, liquid level controllers, and pyrometers. Where Schedule V conflicts with L-134, which curtails use of chromium and nickel in industrial instruments, the less restrictive order will govern. L-272 applies only to new purchase orders. Gages are used chiefly in the shipbuilding, rubber, high octane, and chemical warfare programs. Almost 70% of the output of regulators is absorbed by the Navy and Maritime programs, with much of the remainder divided among the high octane and rubber projects.

Preference Order M-189—Chlorinated Paraffin—was revoked last month.

Priorities Regulation 13, as Amended June 10, 1943, embraces further details of special sales of industrial materials, including those to the Rubber Reserve Co. Among the materials covered are: antimony, magnesium, vinyl acetate and polymers thereof, acetic anhydride, acetic acid, acrylonitrile, alcohols, butadiene, carbon black, carbon tetrachloride, chlorinated hydrocarbon solvents, organic dyestuffs, quanidine, hexamethylenetetramine, lithopone, phenols, plasticizers, plastics, resins, styrene, toluene, vinyl polymers, zinc oxide, cotton, linters, and duck, rayon yarn, latex, crude rubber, balata, chlorinated rubber, synthetic rubber, reclaimed rubber, and rubber products including cement, elastic thread and fabrics, and yarn.

Personnel Mention

Committees to draft quality specifications of two synthetic rubber products and one plastic material for high-frequency flexible cable used in military radio and radar were appointed at a meeting of the High Frequency Flexible Cable Industry Advisory Committee with the WPB. Specifications will be sent to WPB with the recommendation that they be used as a basis for the allocation of materials.

Among the members of the recently appointed Rigid Electrical Conduit Industry Advisory Committee are I. A. Bennett, National Electric Products Corp., Pittsburgh, Pa.; Jack McAulliffe, Triangle Conduit & Cable Co., Inc., New Brunswick, N. J.; and A. E. Newman, General Electric Co., Bridgeport, Conn.

New Schedule for Government Rubber Goods; More OPA Notes

A new maximum price regulation, 403, effective June 17, for most important rubber commodities bought for governmental use permits unified handling of pricing problems in sales of the specified rubber commodities to the government, especially in view of the recent pricing program for crude and synthetic rubber worked out by the Rubber Reserve Co., the Office of the Rubber Director, and the OPA. Establishing April, 1943, as the base date to provide for changed costs of synthetic rubber that recently became effective, MPR 403 gives the pricing method for manufacturers to apply to goods the same as or similar to those sold or offered for sale in the base period, and also to goods different from those sold in the base period. Other sellers than manufacturers are to establish their maximum prices by applying mark-ups to their purchase prices for the commodities.

Upon application to it and filing of required information by the manufacturer or seller, OPA will approve prices for those commodities which cannot be priced under the specified methods. In these cases the commodities are exempt from price control for three months until the OPA establishes a maximum price, in order not to impede production and delivery of important war materials. Also for similar reasons, commodities sold under secret contract or developmental contracts are exempt from price control. However following the end of such secret or developmental period for any commodity, it becomes subject to maximum prices under the regulation.

Commodities in Appendix A of MPR 403 are covered when wholly or partly of rubber, and when sold pursuant to a war order. They are considered as the latter when delivered to or for the account of any agency of the United States Government; but not when delivered to or for any corporation owned or controlled by the federal government, but not operated by it, or when sold for post exchanges, ship's stores, commissaries, or similar purchasers. It also applies to sales made to contractors or subcontractors of goods to be physically incorporated into materials to be delivered to agencies of the United States Government. The list includes wearing apparel and findings; personnel equipment and miscellaneous items from airplane deicers through lifebuoys to tarpaulins. Nearly all are military items.

Maximum prices covered by the regulation were established formerly under one or another of four other regulations: the General Maximum Price Regulation and Maximum Price Regulations 157, 149, and 220. The last three cover, respectively, Sales and Fabrication of Textiles, Apparel and Related Articles for Military Purposes; Mechanical Rubber Goods; and Certain Rubber Commodities. MPR 403—Certain Rubber Commodities Purchased for Governmental Use—supersedes these four regulations.

Coated fabrics, footwear and wearing apparel, including findings, and other individual, organizational, or ship's personnel equipment for military use made in whole or in part of rubber are removed from MPR 157 by Amendment 8, effective June 17. MPR 157 covers sales and fabrication of textiles, apparel, and related articles for military use, but such articles containing natural, reclaimed, synthetic or substitute rubber, with the exception of coated fabrics, are now covered by MPR 403. Coated fabrics became subject to MPR 220.

Reductions in manufacturers' and wholesalers' maximum prices for mechanical rubber goods to reflect lowered prices of synthetic rubber used in them were announced June 4 by the OPA. Government buyers and industrial consumers will gain most benefit from the reduced prices. The changed ceilings are established by Amendment 9 to MPR 149, effective June 17. The amendment supersedes the General Maximum Price Regulation with regard to wholesalers' sales covered by the June 4 provisions. All wholesale sales of mechanical rubber goods are now covered by MPR 149 except those of packing, gaskets, and automotive parts.

Reduction of manufacturers' prices is made according to one or the other of two methods. In the case of commodities for which the manufacturer had a regularly quoted price on the base date, the former maximum price is decreased by an amount equal to the difference in cost between the synthetic rubber used in the commodity on June 1, 1943, and that used on the base date, which is October 1, 1941, for commodities in Appendix A of the regulation, and January 5, 1942, for commodities in Appendix B. For commodities for which the manufacturer did not have a regularly quoted price on the base date, the use of the June 1, 1943, price of synthetic rubber used in the article is to be used in computing the ceiling. In such cases the maximum price for deliveries of mechanical goods containing synthetic rubber made after the effective date of this amendment must be recomputed in accordance with this provision.

Where the commodity dealt in by the manufacturer on the base date is the same except for the substitution of GR-S (Buna-S) or GR-I (Butyl), for natural rubber, there is no change in the maximum price.

Inclusion of wholesalers' maximum prices in the regulation is done to simplify the reduction of their prices in line with the cut in manufacturers' prices. While insuring that industrial consumers benefit from the reduced prices, the wholesaler is benefited also by being given the same base date for both his purchase and selling price for a given article.

Wholesalers' maximum prices are to be determined by application of percentage mark-ups to the invoice cost of the commodity. The method for determining the mark-up to be used is given in the amendment.

Another change in the regulation made by the new amendment is reduction of the differentials which may be added to the maximum price for hose of natural rubber to determine the maximum price for hose made of neoprene. This also is based on the lowered price of the synthetic rubber.

Amendment 11 to 149, however, postponed until July 10 the effective date of Amendment 9. This action followed a meeting with a newly appointed industry advisory committee in New York. The additional 23 days' time is provided so that, in accordance with suggestions from the industry, the development of specific dollars-and-cents ceilings may be considered. The action affects chiefly rubber hose, sheet packing, and other items made of neoprene.

The committee concerned is one of the first formed by OPA without an initial request from industry, in accordance with a recently announced policy.

W. S. Richardson, of The B. F. Goodrich Co., Akron, O., was elected chairman of the Mechanical Rubber Goods Advisory Committee at the meeting on June 11. All other committee members were present: W. H. Cobb, United States Rubber Co., New York; W. C. Winings, Goodyear Tire & Rubber Co., Akron; R. S. Wharton, Quaker Rubber Corp., Philadelphia, Pa.; J. H. Hayden, Hewitt Rubber Corp., Buffalo, N. Y.; K. H. Glanton, Dayton Rubber Mfg. Co., Dayton, O.; George L. Abbott, Garlock Packing Co., Palmyra, N. Y.; P. H. Henkel, Continental Rubber Works, Erie, Pa.; O. S. Dollison, Republic Rubber Division, Lee Tire & Rubber Co., Youngstown, O.; F. D. Hendrickson, American Hard Rubber Co., New York; E. J. Tesdell, Gates Rubber Co., Denver, Colo.; H. R. Mansfield, Pioneer Rubber Mills, San Francisco, Calif.; C. D. Easly, Elkhart Rubber Works, Elkhart, Ind.; C. L. Bugert, Toledo Industrial Rubber Co., Toledo, O.; and W. I. Lewis, Boston Woven Hose & Rubber Co., Boston, Mass. There may be one or more additions to the committee, OPA stated. OPA representatives who attended the meeting were Everett D. Hawkins, Philip G. Hudson, and E. Lerten, of the Washington office, and Thomas L. Lloyd, of the New York regional office.

In Amendment 9 to MPR 220, effective June 17, OPA also lowered manufacturers' maximum prices covered by that regulation to reflect decreased costs in the use of synthetic and substitute rubber and balata. These reductions are effected in substantially the same way as are the reductions in ceilings for manufacturers' prices of mechanical rubber goods. MPR 220 covers specifically listed products which include such items as apparel wholly or partly of rubber, cements and adhesives, tire repair materials, and miscellaneous rubber articles.

New rubber tires and tubes of Buna S for original equipment, when sold to the government pursuant to war orders, are exempted from price control for an additional month, from June 1 to July 1, 1943, by Amendment 3 to MPR 119—Original Equipment Tires and Tubes—effective May 29. The extension is to give the industry time in which to accumulate production experience and cost data involving use of the synthetic rubber in sufficient quantity to enable OPA to set specific ceilings. The

Army and Navy are cooperating with OPA in maintaining fair prices for these products, most of which are sold to the Armed Services.

Amendment 2, Temporary MPR 31—Federal Government Purchases of New Rubber Tires and Tubes—effective May 26, exempts also from the terms of the order sales and deliveries to Rubber Development Corp. Amendment 3 (June 11) further declares that the regulation does not apply either to imported tires and tubes sold by Rubber Development Corp.

Producers using rubber in making machines or machinery parts for government use were provided by Amendment 89 to MPR 136, as Amended—Machines and Parts, and Machinery Services—effective June 3, with an adjustable pricing provision which permits them to quote higher than ceiling prices to reflect cost rises resulting from an authorized increase in the price for crude rubber on April 1. The action does not allow the machinery producers to collect prices in excess of ceilings at time of delivery, but enables sellers to give quotations and accept orders at prices including an allowance for the increased price of rubber in their products without violating MPR 136. The effect of this increase on the cost of machines and parts is being studied by OPA, and Amendment 89 provides a temporary device for pricing so that manufacturing and contracting will not be impeded until a final decision on the necessity of an adjustment of ceiling prices is made.

"Emergency Tires" Now Available

Approximately a million to a million and a half used tires unfit for recapping, but which can be made serviceable for limited emergency use will be added to the supply of used and recapped tires available for rationing as spares and to low-mileage passenger-car drivers, Rubber Director Wm. M. Jeffers announced June 21. The OPA has been asked to screen carefully all requests for spares. These tires will serve as adequate spares during the next few months. The tires, called "emergency tires" and branded with an "O" on the sidewall to identify them, can be purchased from regular dealers by motorists with certificates for Grade III tires. No. "O" tire is to be recapped prior to sale.

The emergency casings, part of the 12,000,000 collected under the Idle Tire Purchase Plan are held by Defense Supplies Corp. Originally set aside as not suitable for permanent repairs and recapping, these tires have been resurveyed to recover any that could be put into shape by temporary repairs for use as spares and by low-mileage drivers.

Dealers stocking the tires will buy them through regular trade channels. They can either resell them unrepaired and let the buyer arrange to have the necessary repairs made, or they can add temporary repairs and sell the tires at a price that will recognize this service. The temporary repairs can be made with reliners, patches, and boots. The OPA has established ceilings with suitable differentials as compared with used tires of better quality. Amendment 12 to MPR 107—Used Tires and Tubes—effective June 22, sets a maximum price of $1 for an unrepaired "emergency tire." DSC is selling the tires to dealers at 50¢ each.

The plan whereby the tires will be sold from DSC warehouses with appropriate OPA accounting controls follows: 1. Dealers can place an order for from 25 to 200 with any manufacturer. Only one order can be placed for any one establishment. 2. The manufacturer, through The Rubber Manufacturers Association of America, Inc., forwards the order to the Defense Supplies Corp., which then ships to the dealer. 3. Within five days after the shipment RMA sends to the OPA Regional Office serving the dealer's district a copy of the shipping order, which is sent to the OPA District Office serving the area in which the dealer is located. Thus the District Office is notified that the dealer's inventory has been increased to the extent of the order. 4. Ten days after receiving the tires the dealer reports to his District Office the number unfit for further use. Those that are usable or can be made usable by temporary repairs can be sold to holders of Grade III Rationing Certificates. The dealer is required to hold the unfit tires for 30 days after the date of the report so that they will be available for examination by an OPA representative. After 30 days the rejected tires can be scrapped.

Tire Price and Rationing Changes

Amendment 11 to RPS 63 — Retail Prices for New Rubber Tires and Tubes —effective June 11, covers several changes to the schedule. First, in another action to provide decisions in local price control matters as nearly as practicable at the regional or district level, the OPA authorizes the OPA Territorial Director of Hawaii to decide whether retail dealers in that Territory may add any part of the 16% allowed for dealer tire return pooling charges in the United States to their maximum prices for passenger-car rubber tires and tubes not actually returned under the Dealer Tire Return Plan.

Besides, maximum retail prices are set for brands of passenger-car and truck tires and tubes of four domestic distributers not previously listed separately.

Also, several sizes of brands of truck tires and tubes are given specific prices for the first time. They are standard sizes that the brand owners started to sell after November 25, 1941, adding the sizes in most cases because of WPB requirements as to uniformity in sizes.

Another change provides maximum retail prices for all brands of passenger-car tires of Vogue Rubber Co., Chicago, Ill., at the level in effect for this company on November 5, 1941. Previous provisions of the regulation inadvertently required the company to price its tires below their normal price level, and the change is made to bring their prices into line with prices established by the regulation.

Maximum prices for recapping farm tractor tires with Grade F camelback, and for recapping truck and bus tires, size 8.25–20 and larger, with Grade A camelback, were established in Amendment 2 to RPS 66, as Amended—Retreaded and Recapped Rubber Tires and the Retreading and Recapping of Rubber Tires—effective June 7. These prices reflect changes in use of grades of recapping material ordered by the WPB and result in slightly lower ceilings for the farm tractor tires and slightly higher ceiling prices for recapping truck and bus types.

WPB has directed that Grade C camelback may not be sold for use on farm tractor tires after June 1, confining recapping of such tires to Grade F camelback. Therefore the new ceilings reflect the reduction of direct material cost caused by the use of the lower grade camelback made entirely of reclaim rubber. WPB also has authorized use of Grade A camelback for recapping larger sizes of truck and bus tires. Formerly only Grade C was employed, but it was found that Grade A gives substantially more mileage and therefore will conserve rubber more effectively to warrant its use on these large sizes.

The ceilings established for recapping the specified truck and bus tires with Grade A camelback are somewhat higher than for recapping with Grade C camelback. This difference is based on the changed direct material cost. For example, for retreading a truck or bus, size 8.25-20, with a conventional tread, when the carcass is furnished by the purchaser, the ceiling price using Grade C camelback is $17.80; but with Grade A camelback it is $18.65. Grade A camelback is made largely of crude rubber; while Grade C contains a substantial amount of reclaim.

New rubber tires and tubes of types made only since 1941 for original equipment may be priced by their producers according to a procedure given in Amendment 4 to 119, effective June 30, which provides that in establishing ceilings for rubber tires and tubes of types not sold during 1941 for original equipment of vehicles or otherwise, but made and sold for original equipment since then, the seller must submit suggested maximum prices to OPA. The prices must be accompanied by a description of the pricing method and other specified information. After receipt of this information OPA will authorize either specific maximum prices or the pricing method that the seller may use to determine them. Prices for the new items must be in line with those for original equipment such as were sold in 1941. Current maximum prices for 1941 type tires and tubes were set, beginning April 27, 1942, at levels 5% higher than 1941 prices.

Other changes in the amendment are in wording only. It is made clear that the seller need not seek price authorization from OPA for a tube or tire if the same type, brand, and size were sold during 1941, even though the present item may be made of different materials.

Several more amendments have been added to RO 1A—Tires, Tubes, Recapping and Camelback. No. 30 (May 27) reads that application for authority to make a transfer shall be made by the transferor, who shall give the names and addresses of the transferor and transferee, and the number, type, and grade of tires or tubes to be transferred. Amendment 31 (June 9) presents a plan whereby operators of fleets of commercial and non-high-

way vehicles, who often need many tires at one time, can file single applications for rationing certificates covering their aggregate needs.

The next amendment, effective June 12 and adopted because some dealers were running out of some types and sizes of tires, permits farmers requiring farm implement or front-wheel tractor tires to buy suitable substitutes when they cannot find a dealer with tires designed expressly for their purpose; and dealers may also sell to passenger-car owners tires and tubes of a slightly different size than is indicated on the rationing certificate. Also, because of manpower shortage, a tire inspector may certify a casing for recapping, without removing it from the rim; the recapper examines the casing anyway before applying the new tread. The amendment further allows a dealer who takes back a defective tire from a customer in exchange for a tire sold on certificate to return the defective tire immediately to his supplier for adjustment, instead of waiting the customary 30 days, provided the dealer keeps a complete record of all the details of the transaction.

No. 33 (June 12), in order to simplify reporting procedures and utilize reports made to other government agencies whose records are available to OPA, eliminates some inventory reports and records required of the tire trade and commercial vehicle fleet operators and reduces the frequency of some of the other reports still required. Besides, when a tire supplier gets replenishment portions of rationing certificates from a dealer who has not endorsed them, the supplier may fill in the dealer's name and address and the date, and then ship the tires ordered. Previously the certificate had to be returned for proper endorsement and then forwarded again to the supplier before the tires could be shipped.

Amendment 34, effective June 21, gives rules whereby the purchaser of a used car may qualify for a gasoline ration to operate it even though he is unable to obtain a Tire Ration Record from the previous owner.

Provision for retail sales of suitably branded unrepaired used tires to holders of rationing certificates is contained in Administrative Exception order No. 47 to RO 1A, effective June 25, to permit consumers to buy "emergency tires." Previously sale of tires needing repairs was forbidden.

Supplement 1 to RO 1A, Amendment 1, effective June 9, changes certain conditions governing transfers of tires and tubes in territories and possessions. Authorized are certain transfers of tires and tubes without certificates; added is a section relating to transfers of used tubes.

Allotments of passenger-car and truck tires by the Office of Rubber Director for rationing in June were little changed from May. The quota of Grade III passenger-car tires, used or recapped casings, showed the greatest change, 690,000 for June, against 600,799 for May. Quota of Grade I tires—all new passenger-car tires are Grade I—were 1,012,000 for June, compared with 1,006,882 in May. June truck tire quotas totaled 414,066, against 414,108 for May. Passenger-car inner tube quotas for June were 828,000, against 735,781 in May, and for trucks 338,606, against 434,355. July quota figures follow: Grade I tires, 1,061,261; Grade III, 414,931; Truck tires, 414,977; inner tubes for passenger cars, 736,500, for trucks, 332,056.

Mechanical and Drug Sundries

Essential producers of essential mechanical rubber goods may secure an individual adjustment of their ceiling prices in certain specified cases, accordng to Amendment 10 to 149, effectve June 15, which is in conformance with the President's Executive Order that forbids increases which affect the cost-of-living, except those in accordance with the minimum requirements of law. An essential producer is defined as one whose output of the commodity cannot reasonably be expected to be replaced at a price lower than the proposed adjusted maximum price, or any manufacturer who has entered into, or proposes to enter into a war contract or subcontract. An essential mechanical rubber good is one which contributes to the effective prosecution of the war.

If the tests of essentiality can be met, the manufacturer must also show that the maximum price of the item is at such a level that, taking into account the cost of the item, the profits position of the manufacturer and the nature of his business, output of the item is impeded or threatened, and that an increase would not affect the cost of living. Manufacturers who can meet these conditions may file an application for adjustment on Form OPA 696-167a and in accordance with Revised Procedural Regulation No. 1. Copies of this form are obtainable at any OPA field office. OPA further announces that the manufacturer may file an application for adjustment if he believes that the conditions just described would exist if the National War Labor Board should grant a pending application for wage increase.

An adjustment also may be granted to an essential producer of an essential mechanical rubber good in any case in which he agrees to make a reduction in the selling price of another commodity, or other commodities, which will equal or exceed the total dollar amount in terms of annual revenue of the adjustment granted. If such an adjustment is allowed, the OPA will require appropriate reports relating to the commodities affected. No form is provided for these applications, but they must be filed in accordance with Revised Procedural Regulation No. 1. Adjustments may be made by the national office of OPA, any regional office, or such offices as may be authorized by an order issued by the proper regional office. The application is to be filed with the national office where the manufacturer's sales during 1942 exceeded $500,000 and with the appropriate regional office where the manufacturer's sales during that year did not exceed $500,000.

Except where the manufacturer seeks an adjustment on the ground that he will lower the selling prices of other commodities, sales may be made at the requested price while the application is being considered. In such case the only restrictions imposed are that the manufacturer may not receive payment of any amount which exceeds the maximum price until the requested adjustment has been made, and that the manufacturer shall inform the person to whom he is selling of the maximum price, that an application has been filed and that the specific price quoted is subject to OPA approval.

Because this provision is, in substance, the same as that in Procedural Regulation No. 6, OPA's Supplementary Order No. 9 is superseded by it in so far as it relates to MPR 149.

Temporary manufacturers' ceiling prices for syringes, catheters, and similar rubber drug sundries made of neoprene were established in Amendment 7 to Maximum Price Regulation 300—Maximum Manufacturers Prices for Rubber Drug Sundries—effective May 25. Wholesale and retail prices are determined by use of mark-ups found in MPR 301—Retail and Wholesale Prices for Rubber Drug Sundries. The new ceiling will expire September 30, 1943, before which date OPA expects to revise and possibly lower them in some instances. They are set on the basis of as close estimates as could be made at present through studies of the industry and consultation with its members. But more production experience than the industry has had to date with products made of neoprene is desirable. Manufacturers' ceilings for neoprene bulbs and bulb goods are set at differentials ranging from 5 to 15¢ over ceilings for the same commodities made of natural rubber. For glass molded surgical tubing, prices of neoprene articles are established in dollars and cents per dozen items.

Use of the more costly synthetic for a large portion of bulbs, bulb goods, and glass molded surgical tubing has been required by the Office of the Rubber Director to conserve crude rubber for other purposes. Until recently neoprene was not available for such use in quantity.

Some bulbs and bulb goods made of natural rubber will be available still, OPA said. The fact that the major production of syringes and surgical rubber tubing will be of neoprene may, however, prove less costly to the consumer in the long run because neoprene is said to have better aging qualities than natural rubber and is more resistant to oily substances.

The sixth amendment to MPR 301, also effective May 25, extends from June 1 to September 30, 1943, the period during which wholesale prices of rubber drug sundries, except Victory Line rubber sundries, sold by dental, surgical and hospital supply houses, are excepted from control under the regulation. During this period they remain subject to the General Maximum Price Regulation while OPA continues investigation of pricing practices of the supply houses, and of claims that mark-ups provided for them in MPR 301 are insufficient. It had been expected that the investigation would be completed by June 1, but more time is needed. Retail prices are not affected.

Committee Reports

Ceiling prices for products containing synthetic rubber were among problems

discussed at meetings of three industry advisory committees planned by the OPA the week of June 21. The Waterproof Rubber Footwear Manufacturers' Advisory Committee met in Washington on June 22; while the Mechanical Rubber Goods Industry Advisory Committee convened in New York the next day. Also in New York, the Rubber Heel & Sole Manufacturers Advisory Committee met June 24. In making the announcement, OPA gave names of officers of four committees; the above and the Rubber Drug Sundries Industry Advisory Committee. The officers were elected at organization meetings of the committees early last month. All four committees were appointed by Price Administrator Prentiss M. Brown without waiting for demand for such action by the industries. This action was in line with the policy announced June 9.

Officers of the rubber heel and sole committee follow: chairman, Fred Lang, manager, shoe products division, B. F. Goodrich Co., Akron, O.; vice chairman, Earl Bunting, president, O'Sullivan Rubber Co., Winchester, Va.; secretary-treasurer, George Flint, director, heel and sole division, Rubber Manufacturers Association, New York, N. Y.; chairman repair trade sub-committee, Morris Eisen, president, Holtite Mfg. Co., Baltimore, Md.; chairman shoe factory trade sub-committee, A. C. Grimley, sales manager, soles and heels division, United States Rubber Co., New York; chairman hardware and chain store trade sub-committee, Philip Bernstein, vice president, Plymouth Rubber Co., Canton, Mass. Other members of the committee are: W. H. Cary, Avon Sole Co., Avon, Mass.; Edwin Calvin, Bearfoot Sole Co., Inc., Boston, Mass.; C. P. Winkler, Cupples Co., St. Louis, Mo.; L. A. Case, Essex Rubber Co., Trenton, N. J.; Harry L. Post, Goodyear Tire & Rubber Co., Inc., Akron; J. B. Renolds, Hagerstown Rubber Co., Hagerstown, Md.; Sol Schwaber, Monarch Rubber Co., Inc., Baltimore, Md.; M. J. Bernstein, Panther-Panco Rubber Co., Inc., Chelsea, Mass.

Chief problem before the rubber heel and sole manufacturers' committee, OPA said, is the question whether maximum pricing for the factory trade and for heels and soles sold by hardware stores shall continue under the General Maximum Price Regulation or be placed under a separate regulation.

Officers of the waterproof footwear committee are: chairman, Elmer H. White, general manager, footwear division, U. S. Rubber; secretary-treasurer, Charles Baker, Goodyear Footwear Corp., Providence, R. I. Other members are: J. S. Barrie, Hood Rubber Co., Watertown, Mass.; A. H. Wechsler, Converse Rubber Co., Malden, Mass.; and Henry B. Morse, Endicott-Johnson Corp., Johnson City, N. Y.

Officers of the drug sundries committee follow: chairman, Harry J. Haflin, general sales manager, general products division, U. S. Rubber; secretary, George Flint, assistant secretary, RMA. Other members are: Virginia P. Casey, Davidson Rubber Co., Boston; Wallace DeLaney, Faultless Rubber Co., Ashland, O.; Burton F. Stauffer, Goodrich; H. W. Gordon, Goodyear Rubber Sundries, New Haven, Conn.; R. J. Limbert, Lee Rubber & Tire Co., Conshohocken, Pa.; W. B. McIntosh, Pyramid Rubber Co., Ravenna, O.; Julius Schmid, Jr., Julius Schmid Co., New York; Leon R. Nodine, Davol Rubber Co., Providence; T. L. Gibbons, Seamless Rubber Co., New Haven; Don Glass, Seiberling Latex Products, Barberton, O.; Karl Herbruck, Wilson Rubber Co., Canton, O.

Sparks E. Bonnett, associate chief of the tire rationing branch in Washington, has been made chief, to succeed Robert S. Betten, recently commissioned a lieutenant in the Navy.

Lester V. Chandler, professor of economics on leave from Amherst College, was named price executive of the OPA rubber price branch, succeeding Robert F. Bryan.

Other OPA Orders

MPR 406, effective June 22, sets maximum prices for synthetic resins and plastic materials.

Maximum prices for "Methide" (Monsanto Chemical Co., St. Louis, Mo.) are set in Order 487 under 1499.3 (b) of GMPR, effective May 29.

Order 489 under 1499.3 (b), effective May 28, approves maximum prices for Johnson's Cream Wax, product of S. C. Johnson & Son, Inc., Racine, Wis.

Supplementary Directive 1-T, as Amended June 3, 1943, clarifies the authority to ration footwear which the WPB delegated February 8 to the OPA. The term "shoes" means any footwear made wholly or partly "of leather or containing any crude rubber, latex, reclaimed rubber, scrap rubber, or synthetic rubber in the sole, except rubber footwear as defined in Supplementary Directive No. 1-N."

Tire Crisis Foreseen

A crisis in automobile transportation for war workers due to tire wear, making essential prompt attention to recapping and other tire conservation measures, has been predicted by the Public Roads Administration of the Federal Works Agency, Washington, D. C. Investigation of the present tire situation among war workers in 59 Ohio war industries was reported to indicate that nearly half the tires then running would be worn out by the end of the year "under conditions of normal use"—and therefore beyond saving—unless recapped earlier. Later studies in 78 establishments in nine other states showed relatively worse conditions than those in Ohio. The studies also indicated that about 55% of the tires owned at the time of the studies would fail before 7,000 additional miles had been driven, and nearly 80% before 14,000 miles. Many tires had already been worn beyond the recapping stage. Twelve per cent. of the cars had only four tires; while of approximately half of those with five tires, the spare had 4,000 miles or less of service remaining; more than 18% of the spares were beyond the recapping stage, and an additional 34% could not be driven more than 2,000 miles without requiring recapping. Further revealed was a tendency to exceed the 35-mile speed limit, resulting in excessive wear on tires.

A previous survey disclosed that public transportation alone would not be enough to carry all war workers to their jobs so that employes' automobiles must be kept running if war plants are to continue in operation. Recapping and other ways of saving tires, such as share-the-ride groups, low speed, and careful driving, are among the most important factors in keeping automobiles on the road.

Office of Defense Transportation, Washington, D. C., on June 1 under Amendment 6 to General Order ODT 21 amends its tire inspection requirements for commercial motor vehicles to permit a maximum period of 5,000 miles or six months, whichever comes first, between inspections.

Amendment 7, effective June 10, relieves commercial vehicle operators from the order's provisions requiring them to sign receipts for gasoline, parts, tires, or tubes and to endorse the receipts with their Certificate of War Necessity number.

Nat Diamond, until recently on the staff of the Board of Economic Warfare, Washington, D. C., and prior to this for many years associated with Fred Pusinelli & Co., Inc., crude rubber broker, 347 Madison Ave., New York, has opened an office in the Securities Building, 729 15th St., N. W., Washington, D. C., for the purpose of representing rubber manufacturers in their dealings with government agencies.

United States Civil Service Commission, 613 G St., N. W., Washington 25, D. C., has issued a call for persons with executive experience (involving analysis) in business or industry as distributers or manufacturers of such commodities as food, textiles, metals, consumer goods, or industrial equipment. Specialization may have been in sales management, factory management, procurement, market analysis, traffic management, or expediting of production. The positions pay from $2,433 to $7,128; however, few appointments will be made to positions paying $5,228 and over. There are no age limits for this examination and no written tests.

Office of War Information, Washington, D. C., in a report last month on simplification and substitution in consumer goods revealed that in the use of paper for more critical materials in containers and packagings 12,000 pounds of rubber have been saved.

The Combined Production and Resources Board, Washington, D. C., in its third report on combined planning of the production programs of the United States, Great Britain, and Canada, stated that following a comprehensive inquiry into the world rubber position, the Board recommended that over-all consumption of crude rubber in the United States, United Kingdom, Canada, and rest of the British Empire be held to a rate which would leave the combined stock of crude rubber on June 30, 1943, at a certain minimum figure. It is further indicated that this combined stock position will be maintained.

EASTERN AND SOUTHERN

Institute, W. Va., Synthetic Rubber Plant Inspection

At the inspection by the press of the government owned integrated synthetic rubber plant at Institute, W. Va., on May 24, 25, and 26, Paul Alsbaugh, manager of the butadiene and styrene production units being operated by the Carbide & Carbon Chemicals Corp., reviewed briefly the activities of this company in research and production of these materials during the past several years. Carbide & Carbon has been investigating methods for making butadiene since 1930, and early in 1940 research on butadiene was accelerated considerably. In August, 1940, at a conference in Washington with government officials, this company was asked to expand further its research on butadiene and styrene, in view of the possibility that large-scale production of both chemicals might become a necessity. Beginning with the shipment of its first cylinder of butadiene in November, 1940, and a tank truck load shipped to a rubber plant in February, 1941, the first railroad tank car of butadiene ever shipped in the United States left one of Carbide & Carbon's plants in March, 1941. On June 3, 1941, this company was asked to submit estimates of possible butadiene and styrene production, and in August, 1941, it was authorized to design and build a plant for the production of 10,000 short tons of butadiene a year from alcohol for the Defense Plant Corp. at Institute, W. Va. This capacity was increased as the national emergency in rubber became more acute to a final figure of 80,000 short tons a year. Only twenty months were consumed from the start of plant design until the start of production of the first butadiene unit in January, 1943, and the only plant piloting work done was that in connection with catalyst evaluation. The units at Institute are duplicated in other installations at Louisville and Pittsburgh, and the amount of butadiene to be manufactured by the Carbide & Carbon process totals about one-third of the total program.

The construction of a 25,000-ton-a-year styrene unit using a process developed by Carbide & Carbon just prior to the war was started on July, 1942, and the first unit went into production in April, 1943. This plant, which has two units, will be in full operation this month.

Raymond W. MacNamee, of the Research and Development Division of Carbide & Carbon, then discussed some of the chemistry of butadiene and styrene and explained in a general way by means of flow charts the Carbide & Carbon processes for the production of these materials.

After an inspection of the copolymer plant being operated by the United States Rubber Co., George Graham, manager of this plant, after mentioning some of the activities of this company in the field of research and production of synthetic rubber, introduced Sidney M. Cadwell, director of research and development of the Detroit tire plant of U. S. Rubber, who discussed synthetic rubber tires. Dr. Cadwell reviewed the progress of development of the natural rubber tire over the past thirty or more years and then compared this progress with the progress in the last thirty months on synthetic rubber tires, particularly GR-S tires. He showed an evaluation of the rate of progress in plasticization, mixing, tubing, calendering, and building of tires using GR-S rubber and reported that for certain tire uses such as for aircraft tire treads, this synthetic rubber performed better than natural rubber. He referred to the satisfactory passenger-car-size tires that have been made and are giving excellent service in all parts of the country and stated that by reducing the carcass thickness in larger-size tires the difficulty of excessive heat build-up could be minimized. The use of rayon instead of cotton for tire cords in the larger tires permits the use of this reduced wall thickness in the carcass of the tire because of the greater strength per unit of gage of the rayon cord. The use of nylon and other materials for tire cords is also being investigated by U. S. Rubber. Progress in the production of tubes from GR-S has progressed to the point where passenger-car tubes now give service comparable to those made from natural rubber.

An exhibit of both small and large sized tires made from the various synthetic rubbers and samples of the various types of tire failure experienced with GR-S rubber were explained.

The Industrial Latex Co., 380 Pearl St., New York, N. Y., has enrolled all employes and their dependents in the new medical and surgical care plan of Group Health Cooperative, Inc., 1790 Broadway, New York, it was announced recently by J. Schorr, executive of the rubber firm. The entire premium for each employe has been paid by Industrial Latex, and all dependents of employes are eligible to be subscribers.

National Lead Co., 111 Broadway, New York, N. Y., at its May 25 board meeting elected as a vice president, William V. Burley, a director of the company and manager of its St. Louis branch. Mr. Burley joined the auditing staff of National Lead in 1922. In 1925 he was placed in charge of the Mueller Brass Foundry Co., St. Louis, a company subsidiary, with the title secretary-treasurer. In 1934 he became comptroller of the Magnus Metal Co. and later was appointed assistant general manager of the company's Magnus Metal Division, continuing as comptroller. Mr. Burley was made manager of the St. Louis branch in 1939, and was named a director the following year.

Sun Oil Co., Philadelphia, Pa., has appointed Franklyn Waltman director of public relations with headquarters in Philadelphia, to succeed the late Judson Welliver. Mr. Waltman formerly handled public relations work for Sun in Washington, D. C., where he is succeeded by Edwin W. Gableman.

Naftolen Production Expanded

The production of Naftolen, compounding aid for natural and synthetic rubber, has been expanded considerably during the past few months, according to the manufacturer, Wilmington Chemical Corp., 10 E. 40th St., New York, N. Y. In view of the continually increasing demand for Naftolen, the firm is now making plans for additional plant capacity. Along with expanding plant operations, the company has enlarged its research and development laboratory, which now includes fully equipped rubber and plastics units as well as facilities for raw material evaluation. During recent months the rubber laboratory has been centering its efforts on the compounding and processing of GR-S.

The company recently named Edmond du Pont, son of the late Francis I. du Pont, as vice president in charge of plant operations, with headquarters in Wilmington, Del., where he will direct all manufacturing activities. Other officers of the firm are: Herbert Waller, president; Hubert I. du Pont and Edward V. Osberg, vice presidents; and M. A. Solmssen, treasurer. F. S. Rostler who, with V. M. Wilson, originated the Naftolen process, is chief chemist.

James H. Ewing, of Calco Chemical Division, American Cyanamid Co., Rockefeller Center, New York, N. Y., has been elected a member of the board of the Purchasing Agents Association of New York, 120 Broadway, New York.

The Baldwin Locomotive Works, Philadelphia, Pa., effective June 1, made V. H. Peterson assistant to the president. Mr. Peterson formerly was vice president of the Elliott Co., Jeannette, Pa., with which he had been associated many years.

National Industrial Conference Board, 247 Park Ave., New York, N. Y., recently held its twenty-seventh annual meeting and election of officers. Among those named were: Edgar M. Queeny, chairman, Monsanto Chemical Co., St. Louis, Mo., vice chairman of NICB for one year; Clifford C. Anderson, general counsel, Norton Co., Worcester, Mass., Louis C. Cates, president, Phelps Dodge Corp., New York, and E. V. O'Daniel, vice president, American Cyanamid Co., New York, trustees for one year; David M. Goodrich, chairman, B. F. Goodrich Co., Akron, O., and Mr. Queeny, trustees, two-year term; Irenee du Pont, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., trustee, three years.

Carrier Corp., Syracuse, N. Y., has reallocated duties in its marketing division, according to E. T. Murphy, senior vice president in charge of the division. L. L. Lewis has been designated technical adviser in the field of air conditioning; while W. F. Jones is technical adviser in the

field of centrifugal refrigeration. O. W. Bynum, formerly in charge of the southern region, has been transferred to the home office to serve as assistant manager of the division.

Vice President H. L. Laube, head of the engineering division, last month announced the acquisition to the Carrier engineering staff of D. D. Wile, formerly general plant manager of the Kellogg Division of the American Brake Shoe & Foundry Co.

Carrier has also designated T. M. Cunningham general manager, construction and service; while G. D. Harbin succeeds him as regional construction manager of Carrier's Central Region.

The Thermoid Co., Trenton, N. J., and its domestic subsidiaries report record May sales at $1,492,828, against $975,332 in May, 1942. Consolidated sales for the first five months of the current year totaled $6,354,726, contrasted with $5,235,807 in the same period of 1942.

Thermoid Rubber Division has appointed Alexander Hadden district manager covering Westchester and Putnam counties, N. Y., Greater New York, and Connecticut. He will make his headquarters at Thermoid's new industrial rubber products sales office at 330 Fifth Ave., New York, N. Y. Mr. Hadden for the past fifteen years has been covering the same area for The B. F. Goodrich Co., Akron, O.

The Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc., Passaic, N. J., for the third consecutive year won first prize for best business paper advertising campaigns in a contest sponsored by the National Advertising Agency Network. Manhattan also received second award in the employe relations section.

United States Rubber Co., 1230 Sixth Ave., New York, N. Y., through Walter Gussenhoven, sales manager of the mechanical goods division, last month announced the appointment of George C. Crabtree as manager of belting sales. He has been with the company since 1922.

Service Backing Corp., rubberizer and combiner of fabrics and manufacturer of backing cloths, 379 - 38th St., Brooklyn, N. Y., will close its plants and offices from July 3 through July 11 for vacation purposes.

The Nineteenth Exposition of Chemical Industries has been set for the week of December 6 and will be held at Madison Square Garden, New York, N. Y. Production for war and the wartime economy in producing for civilian needs will be the dominant note. Once again the exhibition is under the management of International Exposition Co., 480 Lexington Ave., New York, N. Y., of which Charles F. Roth is president.

U. S. Rubber Reclaiming Co., Inc., 500 Fifth Ave., New York, N. Y., at a recent meeting of the board named Jean H. Nesbit president and treasurer. Mr. Nesbit had been acting as executive vice president since the death of Louis Plumb.

INDIA RUBBER WORLD calls attention to the new postal regulation requiring the district zone after the city in all mailing. Consequently we should be addressed 386 Fourth Ave., New York 16, N. Y.

Marks Thirtieth Anniversary

The United States Rubber Co.'s research laboratories which have contributed many developments, such as new antioxidants and accelerators, many latex products such as "Lastex" yarn, latex web fabric, and latex covered wire, and porous rubber battery separators observed their thirtieth anniversary last month. The general laboratories, first organized in 1913, were established as a separate division of the company at 58th St. and Eleventh Ave., New York. In 1928 more space and equipment were needed, and the laboratories were moved to a modern, five-story building in Passaic, N. J.

Willis A. Gibbons, director of the General Development Department, stated that in contrast to the 4,000-mile life of an automobile tire obtained in 1913, today's tires despite greatly increased speeds will go 30,000 to 40,000 miles with proper care. This improvement in quality of tires was accompanied by better wearing qualities, better performance, and longer life in all other rubber products during the past 30 years and was largely due to the chemical and physical research carried out by the laboratories of the industry.

OHIO

Goodyear Dedicates New Research Laboratory

The keynote of the two-day program dedicating the new research laboratory of The Goodyear Tire & Rubber Co. at Akron on June 22 and 23 was the role of industrial research in winning the war and planning the future. Leaders in American research took part in a series of four symposiums on the subjects of synthetic rubber, plastics, the future of chemistry, and the future of transportation.

The new laboratory, which contains the newest and most powerful tools for scientific research, such as the electron microscope, the analytical spectrograph, and the infra-red spectrometer, is built of reenforced brick and stone in the form of a "U" and contains 74,000 square feet of floor space distributed over three floors. On the ground floor are five large laboratories as well as shops and other rooms. The second floor contains a suite of eleven offices for managerial executives and another group of laboratories devoted to physics, X-ray studies, and microscopic research. A dozen laboratories for analytical and organic chemistry, including one bomb-proof laboratory, are on the third floor. A "cold room" in which temperatures as low as 100° below zero can be obtained and in which 1,500 square feet of space for tests on tires, airplane equipment, and other materials are provided is another feature of the new building.

The present research personnel of the Goodyear research division consists of approximately 125 chemists, physicists, engineers, and metallurgists, along with some 400 others who spend full time on field work. The new laboratory will accommodate double that number of scientists with necessary clerical and other assistants.

Among the new developments announced at the dedication were a new "Cycleweld adhesive process", a joint venture of Goodyear and Chrysler Motors Corp., for bonding rubber to metal or metal to metal, wood, or plastics with as much strength as if the parts in the case of metals were riveted or spot welded; and a "radio static neutralizer," which is expected to find application on airplanes, warships, tanks, cars, etc. Plioflex, a vulcanizable elastoplastic similar in properties to Vinylite, but of an entirely different chemical formula, was also announced. This material is useful for molded automotive parts, heels and soles, jar rings, and for coating fabrics. A wartime replacement for Airfoam, a sponge rubber used while rubber was available for upholstery, is Plastic Foam, a new product highly resistant to the transfer of heat as well as being non-inflammable and waterproof.

The four subjects chosen for the symposiums at the dedication program represent fields in which the Goodyear research division has been and is now more than ever very actively engaged. Synthetic rubber was discussed the morning of June 22 by P. K. Frolich, director of the chemical division of the Esso Laboratories of the Standard Oil Development Corp. and president of the American Chemical Society; N. A. Shepard, chemical director of the American Cyanamid Corp. and active in research on synthetics in the Office of the Rubber Director; and L. B. Sebrell, manager of research for the Goodyear company and recently honored as the 1943 Charles Goodyear Lecturer by the Division of Rubber Chemistry, A. C. S. This symposium was followed by a luncheon at which R. P. Dinsmore, manager of research and development for Goodyear, spoke on the government program on synthetic rubber. Until about a month ago Dr. Dinsmore served as assistant deputy director in charge of research on synthetics for the Office of the Rubber Director in Washington. It had also just been announced on June 21 after a meeting of the board of directors of the Goodyear company that Dr. Dinsmore was elected vice president in charge of research and development for the company.

On Tuesday afternoon plastics was discussed by T. S. Carswell, director of research of the plastics division of Monsanto Chemical Co.; A. M. Howald, of the Plaskon division of Libbey-Owens-Ford Glass Co.; and D. S. Frederick, sales manager of the plastics division, Rohm & Haas Co.

The third symposium, on Wednesday morning, on the future of chemistry was featured by talks by Leland I. Dean, vice president of Dow Chemical Co.; E. R. Weidlein, director of the Mellon Institute for Industrial Research; and G. P. Hoff,

technical director of the nylon division of E. I. du Pont de Nemours & Co., Inc. At noon, Harry N. Holmes, professor of chemistry of Oberlin College and past president of the A. C. S., spoke on the importance of university and college laboratories for the future of industry.

In the afternoon, a discussion on the future of transportation was given by A. B. Culbertson, of Shell Oil Co.; Jerome Hunsaker, of Massachusetts Institute of Technology, the chairman of the National Advisory Council on Aeronautics; and P. W. Litchfield, Goodyear chairman.

The dedication ceremonies concluded with a dinner Wednesday night.

Collyer Speaks on Rubber in War and Peace

In a talk before the New York State Chamber of Commerce in New York, N. Y., on June 3, John L. Collyer, president of The B. F. Goodrich Co., Akron, discussed developments in the rubber industry during the past several years up to and including the Third Progress Report of the Rubber Director and related the activities of the Goodrich company during that same period. He pointed out that because of the wide swings in the price of crude rubber in the past many of his audience probably had said that they were glad they were not in the rubber business. Today, however, we are all in the rubber business—to the extent of a 650-million dollar investment in plants, he said. This investment is three-quarters as large as the entire rubber manufacturing industry of this country in 1939, when it had $865,000,000 worth of private capital invested in it.

As a result of this new development, we are witnessing the creation of a tremendous surplus capacity for the production of rubber. World production may after the war reach a total of 2,700,000 tons a year, more than twice as much as ever consumed even in the biggest years. Greater consumption of rubber by all the other countries in the world in addition to the United States would alter the postwar outlook. This is a long-term outlook, and it is more probable that the production of this tremendous surplus will not be continued. Postwar costs of from 25 to 15¢ a pound for synthetic rubber have been given, but even the lower figure would not eliminate natural rubber on economic grounds. Even if the cost is somewhat higher than natural rubber, the operation of synthetic rubber plants with a capacity of at least 200,000 or more tons a year should be maintained in order to insure military self-sufficiency and to further the progress of the manufacture and use of synthetic rubber. Research activity may result in the ability to double the performance life or usefulness of a certain type of synthetic rubber, which will be the equivalent of a 50% decrease in price.

While recognizing that many conflicting interests must be considered, Mr. Collyer stated that he was confident that if postwar policies were soundly planned and carried out, world consumption of natural and synthetic rubber will within a few years reach 2,000,000 tons. He said he made this prediction on the assumption that low-price rubber—natural or man-made, probably both—will be available in the postwar world.

Goodrich Announcements

Research laboratories devoted to the continuing study of synthetic rubber have been established in McGilvery Hall, Kent State University, Kent, O., by The B. F. Goodrich Co., Akron, according to Waldo L. Semon, Goodrich director of synthetic rubber research. The laboratories and the staff engaged in the activity will be under the direction of Charles F. Fryling, associated with Dr. Semon on synthetic rubber research for six years. The work at Kent State University is planned, however, only for the duration. Scientists assigned to the university laboratories will concentrate their efforts on the government's synthetic rubber program, which this year is expected to produce approximately 250,000 tons.

Goodrich has been awarded a silver merit medal by the War Production Board in the Los Angeles, Calif., area for its leadership "in the development of the synthetic rubber industry and particularly for the worthwhile efforts in the application of synthetic rubber in the war effort." Presentation was made recently to William S. Richardson, general manager of the company's industrial products division while in California on a business trip, by Ensign John Nelson, for the WPB.

John F. Moser, manager of the Goodrich New Orleans district since 1930, has been appointed southeast regional manager for the company's store administration department. He succeeds Carl Wepler, who will become a dealer for the company. New district manager in New Orleans is Donald E. Lagarde, store supervisor in the district since 1940.

Hycar Chemical Co., Akron, has established West Coast warehouse facilities at 1248 Wholesale St., Los Angeles, Calif., according to Frank M. Andrews, general sales manager. This move was made to expedite delivery of the company's products, Hycar OS-10, Hycar OR-15, and Hycar OR-25, and thus more effectively assist the war effort on the West Coast, particularly in the aviation industry where the oil-resistant synthetics are of great importance. Other West Coast industries in which the materials are widely used include shipbuilding and petroleum.

Sherwin-Williams Co., Cleveland, on June 8 appointed Robert F. Ruthruff director of research for Sherwin-Williams and its allied companies. Dr. Ruthruff, an alumnus and former faculty member of the University of Michigan, joined the paint and varnish company in 1939 and previously had been associated with E. I. du Pont de Nemours & Co., Inc., Standard Oil Co. of Indiana, M. W. Kellogg Co.

Firestone Tire & Rubber Co., Akron, on June 22 announced that it is making its DeLuxe Champion tire with Butaprene, a synthetic rubber.

MIDWEST

The Meyercord Co., 5323 W. Lake St., Chicago, Ill., has reported that on the recently launched Patrol Craft Escort built by the Pullman Standard Car Mfg. Co., Chicago, more than 200 Meyercord Decals were used for interior signs and markings, with a resultant saving both in nameplate metals and in hundreds of man-hours of laborious stencilling work.

Monsanto Chemical Co., St. Louis, Mo., has signed Harry W. Lundin, formerly with the Liberty Mutual Insurance Co., as director of the safety and plant protection section of the department of industrial relations.

S. G. Taylor Chain Co., Hammond, Ind., manufacturer of tire chains and load and sling chains for all industrial purposes, last month celebrated its seventieth anniversary. During these 70 years members of one family have been in continuous and active management. S. G. Taylor, Jr., son of the founder, is chairman of the board and father of the concern's present head, E. Winthrop Taylor.

Hugh M. Huffman, formerly of the California Institute of Technology, has been named head of a new laboratory at the Bureau of Mines Experiment Station, Bartlesville, Okla. Initial project will be a study of the possibilities of direct conversion of butane to butadiene as an aid to the economic manufacture of synthetic rubber, requested by the Petroleum Administration for War. The general function of the laboratory will be the determination of the thermodynamic properties of hydrocarbons and their derivatives.

NEW ENGLAND

Godfrey L. Cabot, Inc., 77 Franklin St., Boston, Mass., has reported that one unit of its Guymon, Okla., plant, operating since May 1, has been producing 35,000 pounds of Sterling black a day; while the second unit, in production June 5, will bring the daily total to about 75,000 pounds. Cabot expects the first unit of its Ville Platte, La., Sterling plant to start production July 5, and the second unit, late in the month. Here, too, total daily output will average 75,000 pounds.

C. L. Muench, president of Hood Rubber Co., Watertown, Mass., a division of The B. F. Goodrich Co., Akron, O., recently stated that overshoes, rubbers, boots, and other types of rubber footwear made of specially compounded synthetic rubber have passed actual wear tests under average conditions. The type of synthetic used in this footwear had proved highly resistant to abrasion. The transition to synthetic in footwear, Mr. Muench explained,

will not be readily apparent to the layman because the new footwear looks exactly like that of natural rubber, and for the present, styles and kinds of rubber footwear manufactured will remain the same as now allowed under wartime restrictions, for essential civilian health protection. Hood is now in small, but regular production of synthetic rubber footwear, but expects an increase when the country's synthetic rubber program produces substantial results.

Rhode Island rubber manufacturers during April had 5,269 employes who worked 238,582 manhours, respective gains of 35.8% and 48.8% over April, 1942, figures.

OBITUARY

A. E. Bronson

ADELBERT E. BRONSON, vice president and secretary, Dill Mfg. Co., Cleveland, O., passed away May 26 after a brief illness. Born in Maywood, Ill., he moved to Cleveland in early boyhood, attending public schools there and later Princeton University (Class of 1899) where he studied engineering. After engaging in engineering work for several years he together with Edwin Walton organized the Bronson-Walton Co., consultant engineer. In 1911 Mr. Bronson became associated with the Dill company and was elected secretary and sales manager in July, 1915, and vice president in March, 1928.

The deceased was a member of the Society of Automotive Engineers, Mid-Day Club, and Hermit Club and a director of a Cleveland bank, as well as of his own company. For many years he had been on the legislative committee of the Cleveland Chamber of Commerce.

He is survived by a son and grandson. His wife followed him in death twelve days later.

Charles W. Martin

ON JUNE 7 died Charles Wesley Martin, inventor of several marking devices and president of Martin & Co., Chicago, Ill., manufacturer of rubber stamps and other marking devices, which he had founded in 1888. Mr. Martin, who was born May 7, 1857, in Paris, O., left the third grade of school to become the local blacksmith's helper. He then served successively as a farm hand, railroad brakeman, fish and oyster man, restaurateur, and a rubber stamp salesman before he organized his own company.

The deceased belonged to the Marking Device Club of Chicago, Marking Device Association, Rotary Club, and Shriners.

A bachelor, he is survived by a brother and a sister.

Funeral services were held June 10, with interment in Forest Home Cemetery, Chicago.

Fred B. Peterson

FRED B. PETERSON, retired rubber broker, died in a Brooklyn, N. Y., hospital on June 14 after a brief illness. He was born in Rockford, Ill., 67 years ago. He attended the University of Wisconsin, which conferred an A.B. on him in 1898 and an LL.B. in 1900. Then the deceased practiced law in Milwaukee until 1917, when he went to Washington, D. C., as director of imports for the Federal War Trade Board and remained as such for the duration of the World War.

In this capacity Mr. Peterson became interested in rubber and in 1923 founded Fred B. Peterson & Co., Inc., in New York. He had also served for several years with various Wilson-Holgate companies abroad, including branches at London, Singapore, Colombo, Para, and Manaos. Mr. Peterson likewise was active in the Rubber Exchange Clearing House, New York, serving on its executive committee. Besides he wrote many articles on rubber.

Mr. Peterson belonged to India House, New York Yacht, Montauk, and Oakland Golf clubs, Psi Upsilon, St. Andrew's Society, and the Devonshire Club of London.

Funeral services were held in New York on June 16.

W. E. Sykes

NEWS has come of the death in England on June 19 of William E. Sykes, authority on gears and inventor of the Sykes continuous tooth herringbone gear and the Sykes gear generating machine. Mr. Sykes was formerly associated with Farrel-Birmingham Co. at its Buffalo, N. Y., plant, but for the past six years had been in England operating his own plants, W. E. Sykes, Ltd.

Mr. Sykes was born and trained in England, receiving his technical education at Leeds University. For five years after graduation he worked in one of the world's largest gear plants. In 1908, however, he was appointed factory manager of another large gear plant in England and subsequently was made chief engineer and general manager. In 1923 he joined Farrel-Birmingham, which had acquired the American rights to the Sykes process of gear generation.

Mr. Sykes had taken out more than 100 patents, and he was the author of numerous technical papers. In 1934 he had received the Edward Longstreth Medal from Franklin Institute.

Some years ago, while still in this country, Mr. Sykes organized a company in England to manufacture Sykes gear cutting equipment. This business grew rapidly, and in 1937 Mr. Sykes returned to England to devote his entire time to operating it, but at the same time retained a connection with Farrel-Birmingham as consulting engineer.

He is survived by his wife.

CANADA

Production of "Thiokol" Starts

It was announced on June 14 that the production of "Thiokol" synthetic rubber had started in a plant of Naugatuck Chemicals, Ltd., an affiliate of the Dominion Rubber Co., Ltd., Montreal, P. Q. The supply of this type of rubber has been dependent upon imports from the United States, but now the manufacture of "Thiokol" in Canada will help to extend the Dominion's existing supplies of crude rubber, and coupled with the output of Buna S and Butyl rubbers from the plants of Polymer Corp., Ltd., at Sarnia and Canada's reclaimed rubber production is an indication that Canada is pushing production to the limit to maintain the necessary rubber supply for the prosecution of the war and essential civilian needs. It was stated that "Thiokol" has an established place in Canada's future rubber, whether or not processing of crude rubber is continued on a broad scale after the war, and it was predicted that the manufacture of "Thiokol" would continue in the postwar years.

Order No. 5, issued by Deputy Rubber Controller J. A. Martin, consolidates into one formal order the principal features of all regulations put out by the Rubber Controller regarding rubber.

Canadian Manufacturers' Association recently held its annual meeting and elections. John Miner and J. C. Bouskill, both of Miner Rubber Co., Ltd., Granby, P. Q., were named respectively, vice chairman and a director.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
American Hard Rubber Co.	Com.	$0.25	June 30	June 18
American Hard Rubber Co.	7% Pfd.	1.75 q.	June 30	June 18
Dunlop Tire & Rubber Co.	1st Pfd.	0.625 S.	June 30	June 15
Flintkote Co.	Com.	0.25	June 15	June 10
Flintkote Co.	$4.50 Pfd.	1.125 q.	June 15	June 10
Firestone Tire & Rubber Co.	Com.	0.375	July 20	July 5
Garlock Packing Co.	Com.	0.50	June 30	June 19
General Tire & Rubber Co.	Pfd. A	1.50 q.	June 30	June 19
Goodyear Tire & Rubber Co. of Canada, Ltd.	Com.	0.63 q.	July 2	June 15
Goodyear Tire & Rubber Co. of Canada, Ltd.	5% Pfd.	0.625 q.	July 2	June 15
Lima Cord Sole & Heel Co.	Com.	0.10	June 25	June 10
Mansfield Tire & Rubber Co.	Com.	0.25 extra	June 18	June 10
Mansfield Tire & Rubber Co.	Com.	0.25 q.	June 19	June 10
Mansfield Tire & Rubber Co.	Pfd.	0.30 q.	July 1	June 15
Rome Cable Corp.	Com.	0.15	June 30	June 10
Thermoid Co.	Com.	0.10 q.	June 25	June 14

Rubber Reserve Co. Circular No. 21

Sale of Crude Rubber, Guayule, Liquid Latex and Synthetic Rubber to Manufacturers for use in the Manufacture of End-Products in Connection with "War Orders" (as Defined in War Production Board Supplementary Order M-15-b, as Amended)

1. Rubber Reserve Co. Circular No. 20, dated April 30, 1943, is hereby superseded.

2. Circular No. 17, dated March 23, 1943, sets forth in Exhibit "A"[1] attached thereto the prices at which Rubber Reserve Co. will sell crude rubber, guayule, balata and liquid latex for both "Civilian Use" and "Other than Civilian Use." Said Exhibit "A" further sets forth the prices at which Rubber Reserve Co. will sell GR-S (Buna S), GR-I (Butyl) and GR-M (Neoprene) for "Other than Civilian Use." Rubber Reserve Co. has now determined that it will continue to sell crude rubber, guayule, balata and liquid latex for "Civilian Use" at the prices set forth in said Exhibit "A" and that it will sell GR-S at a price of 18½¢ per pound and GR-I at a price of 15½¢ per pound for "Civilian Use" (plus, in all cases, the uniform freight charge referred to in said Circular No. 17). (No price has been established for the sale of GR-M for "Civilian Use.") Moreover, Rubber Reserve Co. has determined that, although no change will be made in the prices set forth in said Exhibit "A" with respect to "Other than Civilian Use", in view of the problems involved in the adjustment of "War Orders" to reflect such prices, a special procedure for the payment thereof will be established as set forth in Paragraph 3 hereof.

3. After consultation with the War Department, Navy Department, Procurement Division of the Treasury Department, and the United States Maritime Commission, it was agreed that the following procedure will be adopted, effective June 1, 1943, with respect to sales of natural rubber and synthetic rubber for use in the manufacture of end-products covered by "War Orders" (as defined in War Production Board Supplementary Order M-15-b, as amended):

(A) Rubber Reserve Co. shall accept payment from manufacturers at the prices set forth in Exhibit "A" of Circular No. 17, in the Column designated "Civilian Use" and at the prices for GR-S and GR-I listed in Paragraph 2 above, plus the uniform freight charge referred to in said Circular No. 17.

(B) With respect to natural rubber and synthetic rubber used after June 1, 1943, for "War Orders" (as shown by the certificates submitted in pursuance of subparagraph (C) below), the War Department, Navy Department, Procurement Division of the Treasury Department, and the United States Maritime Commission shall make a payment direct to Rubber Reserve Co. in the amount of 17½¢ per pound.

(C) Each manufacturer shall submit to Rubber Reserve Co. monthly appropriate certificates (executed in duplicate in the respective forms hereto attached and designated Exhibits "A", "B", "C", "D", and "E"), reflecting the amount of natural rubber and synthetic rubber actually used in procuring under "War Orders" end-products for which the manufacturer rendered invoices during the month for which the certificate is made. The poundage reported should be based upon the net specification weights of the end-products invoiced, adjusted by a factor representing the difference between the net specification weight and the actual quantities of each material necessary to manufacture each end-product. Such adjustment factors shall be established from recent experience, by as fine a commodity breakdown as the established accounting and control system of the manufacturer will permit. The first such certificates shall cover the month of June and shall be forwarded to Rubber Reserve Co. not later than July 20, 1943. Certificates for each subsequent month shall be forwarded to Rubber Reserve Co. not later than the 20th day of the succeeding month.

(D) In the event that a manufacturer uses no natural rubber or synthetic rubber during any given month in connection with "War Order" end-products, a certificate in the form designated Exhibit "E" should be forwarded to the Treasurer of Rubber Reserve Co. with word "None" reflected in all columns.

(E) Each manufacturer shall maintain adequate records in support of the information contained on the certificates submitted to Rubber Reserve Co., and such records shall be available at all reasonable times for inspection and/or audit by the appropriate government procurement agencies and by Rubber Reserve Co.

(F) Each manufacturer shall promptly submit to Rubber Reserve Co. a list of all of its outstanding "War Orders" (reflecting contract number and government procurement agency) in which the contract price is based upon costs for natural rubber or synthetic rubber in excess of the prices for natural rubber set forth in Exhibit "A" of Circular No. 17, under the Column designated "Civilian Use" or in excess of the prices for synthetic rubber specified in Paragraph 2 hereof. Each manufacturer is expected promptly to take such steps as may be necessary to adjust the end-product prices specified in any of its "War Orders" coming within the foregoing category.

4. Deliveries of crude rubber, guayule, liquid latex, and synthetic rubber will be made in the manner prescribed in Circular No. 17.

5. All requests for the issuance of purchase permits should be addressed to the Office of the Rubber Director as has been the practice heretofore.

6. Manufacturers which have previously purchased crude rubber, guayule, and liquid latex, at the prices set forth in Exhibit "A" of Circular No. 17, in the Column designated "Other than Civilian Use", should forward to the Treasurer of Rubber Reserve Co. a debit memorandum against Rubber Reserve Co. in an amount equal to the difference between the prices actually paid and the prices set forth in said Exhibit "A" in the Column designated "Civilian Use." Manufacturers which have previously purchased GR-S or GR-I at prices in accordance with the provisions of Circular No. 17, should forward to the Treasurer of Rubber Reserve Co. a debit memorandum against Rubber Reserve Co. in an amount equal to the difference between such prices actually paid and the prices set forth in Paragraph 2 above. All such debit memoranda shall schedule by purchase permit number the deliveries and amounts of the purchases in connection with which refund is requested. Checks will be mailed to manufacturers covering the refunds requested in such debit memoranda if the amounts are found to be correct.

7. As used in Paragraph 3, et seq., the term "natural rubber" shall include crude rubber, guayule, and liquid latex (total dry latex solids), and the term "synthetic rubber" shall include only GR-S and GR-I.

8. The Office of Price Administration has requested Rubber Reserve Co. to attach to this Circular the description of revisions in OPA Price Regulations as set forth in Appendix I.

May 31, 1943

Appendix I

Description of Revisions in OPA Price Regulations

1. The adjustable pricing provisions which allowed higher quotations to reflect the expected increase in price of crude rubber will be revoked in all regulations (General Maximum Price Regulation, MPR Nos. 82, 119, 131, 149, 157, 220, and 300, and TMPR 31.) No goods quoted at these higher prices may be delivered at the higher prices unless such higher price is within the maximum price provided by the specific regulation.

2. Because of the recent arrangement on rubber prices the new regulation for certain Federal Government Purchases of new Tires and Tubes does not need to be issued by June 1, 1943. It will, however, be issued shortly.

3. The exemption of Buna tires under Maximum Price Regulation No. 119 from price control will be extended for another month until July 1, 1943.

4. The regulations including pricing formulas will be modified to reflect the lower prices of synthetic rubber.

(a) Maximum Price Regulation No. 149—Mechanical Rubber Goods. In addition, the differential for neoprene hose provided for by this regulation has been reduced to reflect the decreased cost of neoprene. Wholesalers are also brought under the terms of the regulation so that their prices may automatically be adjusted as manufacturers' prices are changed.

(b) Maximum Price Regulation No. 157—Sales and Fabrication of Textiles, Apparel, and Related Articles for Military Purposes. The rubber articles are removed from this regulation and put under a new regulation—Certain Rubber Commodities Purchased for Governmental Use, which is mentioned below.

(c) Maximum Price Regulation No. 220—Certain Rubber Commodities. With the removal of all rubber articles from MPR 157 coated fabrics made for military purposes are placed under MPR 220.

(d) Maximum Price Regulation No. 300—Manufacturers' Prices for Rubber Drug Sundries. Amendments 6 and 7 have already incorporated certain changes in the pricing provisions because of the use of neoprene in tubing, stoppers, gloves, bulbs,

[1] India Rubber World, May, 1943, p. 172.

and bulb goods. No other changes are being made immediately.

5. A new regulation will be issued: Certain Rubber Commodities Purchased for Governmental Use. Most of the items previously were covered by Maximum Price Regulation No. 157. A few specialized items in Maximum Price Regulations 149 and 220 have been incorporated in this regulation. The major outlines of this regulation were discussed in an industry meeting held in Washington, D. C. The pricing provisions have been adapted to the new arrangement for the direct payment to the Rubber Reserve Co. by the various agencies of the federal government.

EXHIBIT "A"

....

....

Treasurer,
Rubber Reserve Co.,
811 Vermont Ave., N. W.,
Washington, D. C.

Dear Sir:

The undersigned hereby certifies that the amount of natural rubber* and synthetic rubber* listed below was actually used in producing, under contracts with the War Department and sub-contracts* thereunder, end-products invoiced during the month of ...., 194...

Service	Contract Symbol	Natural Rubber (Pounds)	Synthetic Rubber (Pounds)
Quartermaster	W—qm—	....	....
Signal Corps	W—sc—	....	....
Engineer Corps	W—eng—	....	....
Chemical Warfare	W—cws—	....	....
Transportation	W—tc—	....	....
Ordnance	W—ord—	....	....
Air Forces	W—ac—	....	....
Medical Corps	W—med—	....	....
Totals		....	....

* The term "natural rubber" shall include guayule and liquid latex (total dry latex solids), and the term "synthetic rubber" shall include only GR-S and GR-I. The term "sub-contract" means any contract or purchase order of the type defined in sub-paragraph (iii) of War Production Board Supplementary Order M-15-b, as amended.

....
(Name of Manufacturer)

....
(Authorized Signature)

....
(Title)

Subscribed and sworn to before me this .... day of ...., 194...

....
(Notary Public)

EXHIBIT "B"

....

....

Treasurer,
Rubber Reserve Co.,
811 Vermont Ave., N. W.,
Washington, D. C.

Dear Sir:

The undersigned hereby certifies that the amount of natural rubber* and synthetic rubber* listed below was actually used in producing, under contracts with the Navy Department and sub-contracts* thereunder, end-products invoiced during the month of ...., 194...

Bureau	Contract Symbol	Natural Rubber (Pounds)	Synthetic Rubber (Pounds)
Supplies & Accounts	Nxs, NOs	....	....
Ordnance	NOrd	....	....
Ships	NObs	....	....
Aeronautics	NOa	....	....
Yards & Docks	NOy	....	....
Marine Corps	NOm	....	....
Coast Guard	TCg	....	....
General and Departmental Field Activities	**	....	....
Totals		....	....

** NOd and all symbols beginning with the letter "N" not listed above.

* The term "natural rubber" shall include guayule and liquid latex (total dry latex solids), and the term "synthetic rubber" shall include only GR-S and GR-I. The term "sub-contract" means any contract or purchase order of the type defined in sub-paragraph (iii) of War Production Board Supplementary Order M-15-b, as amended.

....
(Name of Manufacturer)

....
(Authorized Signature)

....
(Title)

Subscribed and sworn to before me this .... day of ...., 194...

....
(Notary Public)

EXHIBIT "C"

....

....

Treasurer,
Rubber Reserve Co.,
811 Vermont Ave., N. W.,
Washington, D. C.

Dear Sir:

The undersigned hereby certifies that the amount of natural rubber* and synthetic rubber* listed below was actually used in producing, under Lend-Lease contracts with the Procurement Division of the Treasury Department and sub-contracts* thereunder, end-products invoiced during the month of ...., 194...

	Natural Rubber (Pounds)	Synthetic Rubber (Pounds)
Lend-Lease Contracts (Symbol DA-TPS)	....	....

* The term "natural rubber" shall include guayule and liquid latex (total dry latex solids), and the term "synthetic rubber" shall include only GR-S and GR-I. The term "sub-contract" means any contract or purchase order of the type defined in sub-paragraph (iii) of War Production Board Supplementary Order M-15-b, as amended.

....
(Name of Manufacturer)

....
(Authorized Signature)

....
(Title)

Subscribed and sworn to before me this .... day of ...., 194...

....
(Notary Public)

EXHIBIT "D"

....

....

Treasurer,
Rubber Reserve Co.,
811 Vermont Ave., N. W.,
Washington, D. C.

Dear Sir:

The undersigned hereby certifies that the amount of natural rubber* and synthetic rubber* listed below was actually used in producing, under contracts with the United States Maritime Commission and sub-contracts* thereunder, end-products invoiced during the month of .... 194...

	Natural Rubber (Pounds)	Synthetic Rubber (Pounds)
Lend-Lease Contracts (Symbol DA-MCC)	....	....
All others	....	....
Totals	....	....

* The term "natural rubber" shall include guayule and liquid latex (total dry latex solids), and the term "synthetic rubber" shall include only GR-S and GR-I. The term "sub-contract" means any contract or purchase order of the type defined in sub-paragraph (iii) of War Production Board Supplementary Order M-15-b, as amended.

....
(Name of Manufacturer)

....
(Authorized Signature)

....
(Title)

Subscribed and sworn to before me this .... day of ...., 194...

....
(Notary Public)

EXHIBIT "E"

Summary

....

....

Treasurer,
Rubber Reserve Co.,
811 Vermont Ave., N. W.,
Washington, D. C.

Dear Sir:

The undersigned certifies that the amount of natural rubber* and synthetic rubber* listed below was actually used in producing, under contracts with Procurement Agencies of the Federal Government and sub-contracts* thereunder, end-products invoiced during the month of .... 194...

	Natural Rubber (Pounds)	Synthetic Rubber (Pounds)
War Department	....	....
Navy Department	....	....
Procurement Division of the Treasury Department	....	....
Maritime Commission	....	....
ALL OTHER PROCUREMENT AGENCIES	....	....
Totals	....	....

* The term "natural rubber" shall include guayule and liquid latex (total dry latex solids), and the term "synthetic rubber" shall include only GR-S and GR-I. The term "sub-contract" means any contract or purchase order of the type defined in sub-paragraph (iii) of War Production Board Supplementary Order M-15-b, as amended.

....
(Name of Manufacturer)

....
(Authorized Signature)

....
(Title)

Subscribed and sworn to before me this .... day of ...., 194...

....
(Notary Public)

Fixed Government Prices*

	Price per Pound: Civilian Use	Price per Pound: Other Than Civilian Use
Balata		
Manaos Block	$0.38¾	$0.38¾
Swinam Sheet	.42½	.42½
Guayule		
Guayule (*carload lots*)	.17½	.31
Latex		
Normal (*tank car lots*)	.26	.43½
Creamed (*tank car lots*)	.26¾	.44¼
Centrifuged (*tank car lots*)	.27¾	.45¼
Heat-Concentrated (*carload drums*)	.29½	.47
Plantation Grades		
No. 1X Ribbed Smoked Sheets	.22½	.40
1X Thin Pale Latex Crepe	.22½	.40
2 Thick Pale Latex Crepe	.22	.39½
1X Brown Crepe	.21⅜	.38⅞
2X Brown Crepe	.21⅛	.38⅝
2 Remilled Blankets (Amber)	.21¼	.38¾
3 Remilled Blankets (Amber)	.21⅛	.38⅝
Rolled Brown	.18	.35½
Synthetic Rubber		
GR-M (Neoprene GN)	†	.45
GR-S (Buna S)	.18½	.36
GR-I (Butyl)	.15½	.33
Wild Rubber		
Upriver Coarse (crude)	.12⅝	26⅛
(washed and dried)	.20¼	.37¾
Islands Fine (crude)	.14⅝	.28¼
(washed and dried)	.22½	.40
Caucho Ball (crude)	.11⅝	.24¾
(washed and dried)	.19½	.37
Mangabiera (crude)	.08½	.19¾
(washed and dried)	.18	.35½

*For a complete list of all grades of all rubbers, including crude, balata, guayule, synthetic, and latex, see Rubber Reserve Co. Circular 17, p. 169, May, 1943, issue.

†To be determined later.

Patents and Trade Marks

APPLICATION

United States

2,319,272. Patch for Rubber Articles Including an Adhesively Coated Elastic Sheet and a Temporary Inelastic Protective Cover Sheet Adhesively Attached to the Elastic Sheet. D. T. Starr, San Gabriel, Calif.

2,319,556. Physician's Package Including Box to Support therein a Pipette and a Rubber Tube. E. J. Rhein, assignor to Kimble Glass Co., both in Vineland, N. J.

2,319,675. Loading Patch Structure for Stress-Testing Aircraft, Including a Stiff Plate With a Concave Face Conforming Approximately to the Curvature of the Portion of the Skin of the Aircraft to Be Tested; a Body of Resilient Rubber Material Is Adhered to the Concave Face. H. W. Grinter, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,319,818. Resilient Insole Including a Rubber-Like Forepart Portion and a Metatarsal Arch Support Formed on the Rubber-Like Forepart Portion in the Metatarsal Arch Area, and a Projection Integral with the Rubber-Like Forepart Portion. M. Margolin, Elgin, Ill.

2,319,873. Resilient Body Having Two Opposed Layers of Elastic Material, Each Including a Thickness of Latex Devoid of Filler and Sufficiently Porous to Afford Facile Passage of Liquid. W. W. Linz, Chicago, Ill.

2,319,968. Means to Prevent Accumulation of Ice, Including Inner and Outer Extensible Sheets and a Body of Sponge Rubber Incorporated with the Elastic Sheets in the Stretchable Area. M. R. Bell, Cuyahoga Falls, and C. S. Stebbins, Akron, both in O., assignors to B. F. Goodrich Co., New York, N. Y.

2,320,052. Mat Formed of Slats Spaced Apart and Tie Members of Reenforced Rubber or the Like. J. A. Rodriguez, Houston, Tex.

2,320,078. Frictionally Supported Tubular Covering Member Having a Base Portion, the Inner Surface of Which Is Coated with a Layer of Rubber Cement. C. A. Harpootlian, Brooklyn, assignor to Modern Accessories, Inc., New York, both in N. Y.

2,320,085. Means for Resiliently Supporting a Truck Bolster, including an Annular Rubber Element. J. Ledwinka, assignor to E. G. Budd Mfg. Co., both in Philadelphia, Pa.

2,320,220. Engine Starter Drive, Including a Sleeve, a Barrel, and a Band of Elastically Extensible Rubber-Like Material Fixed at Its Ends to the Barrel and Sleeve Respectively and Arranged to Wrap Down on the Sleeve and Transmit Rotation therefrom to the Barrel with a Friction Snubbing Action. J. E. Buxton, Elmira Heights, N. Y., assignor to Bendix Aviation Corp., South Bend, Ind.

2,320,442. Electroplating Equipment to Be Subjected to Electrolyte, Including a Part Insulated from the Electrolyte with a Stretched Elastic Tape Consisting Essentially of a Plasticized Copolymer formed from a Vinyl Ester of an Aliphatic Carboxylic Acid Having from Two to Six Carbon Atoms with a Member of the Group Consisting of Vinyl Halides and Vinyl Benzene. A. E. Maibauer, Travis, S. I., assignor, by mesne assignments, to Union Carbide & Carbon Corp., New York, both in N. Y.

2,320,517. Photographic Film Having a Developed Photographic Image Coated with an Adherent Coating of Nitrated Rubber in Admixture with Cellulose Acetate. M. Gelfand, Dallas, Tex.

2,320,579. End Ferrule Assembly Including a Rubber Hose with its End Portion Reduced in Diameter to Fit Snugly Inside the Ferrule. G. G. Eisenbeis, assignor to Stow Mfg. Co., Inc., both of Binghamton, N. Y.

2,320,906. Flush Tank Silencer Including a Tubular Rubber Body Adapted to Be Telescoped on to a Hush Tube, the Lower End of the Body being Normally Closed and Slitted, the Portions of the Body on Opposite Sides of the Slit Being Thicker Than the Body Portions at the Ends of the Slit. F. Bent, assignor to J. M. Bales, both of Los Angeles, Calif.

2,321,159. Goggles for Use by Players in Sports, Including a Relatively Thick, One-Piece Molded Rubber Lens-Holding Frame Providing Relatively Thinner Walled Lens Pockets of Slightly Elastic Rubber Joined Integrally by a Thicker Distortion Resisting Bridge Portion. D. T. Ryan, Beloit, Wis.

2,321,236. In a Valve, a Passage Opening on One Side of the Smaller Body Portion and a Flat Rubber Band Valve Surrounding the Smaller Body Portion and Normally Closing the End of the Passage. V. Parkin, Los Angeles, Calif.

2,321,777. Overlapping Joint for a Structure, Including a Supporting Wall with a Layer of Soft Rubber Adhering to It. H. J. Schelhammer, Whitestone and W. Hiemann, assignors to American Hard Rubber Co., both of New York, N. Y.

2,321,889. Coating a Ferrous Metal Surface with Rubber. G. C. Bailey, Elizabeth, and O. Johnson, Metuchen, both of N. J., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,322,193. The Combination Including Rigid Side Plates and an Intervening Cushion Element of Resilient Incompressible Material Such as Rubber Having a Plurality of United Tiers. G. H. Kaemmerling, Erie, Pa., assignor to Lord Mfg. Co., a corporation of Pa.

Dominion of Canada

412,522. In a Holder for a Bottle or Similar Container, a Rigid Frame of Greater Breadth Than That of the Base of the Container to Be Held, and an Elastic Sheet Rubber Member Extending Flatwise across the Frame. E. J. Koontz, Richards, Mo., U. S. A.

412,561. In a Delayed Action Cutout Switch to Control the Actuating Coil of a Plunger Type Electro-Magnet, a Support with the Plunger, a Fixed Contact Mounted upon the Support and a Movable Switch Member Including a Rubber Switch Arm. Canadian General Electric Co., Ltd., Toronto, Ont., assignor of R. W. Goff, Schenectady, N. Y., U. S. A.

412,611. Seat Construction Including a Ply of Yielding Padding Material over a Spring Structure, a Seat Cover of Trim Fabric Having a Narrow Continuous Band of Rubber Extending from Front to Back of the Fabric and Vulcanized to the Underside thereof; the Fabric and the Rubber Are Embossed to Form a Decorative Design. National Automotive Fibres, Inc., assignee of G. R. Cunnington, both of Detroit, Mich., U. S. A.

412,673. Vacuum Bottle Cork Including a Semi-Elastic Rubber Body Provided with a Recess at the Outer End and Extending Internally to the Opposite End. G. A. Kimber, Chicago, Ill., U. S. A.

412,681. Pipe Joint for Joining Plain Pipe Ends, Including a Housing Surrounding the Pipe Ends, Which Is Divided at Radeal Planes Into a Plurality of Parts, and Continuous Rubber Rings Surrounding the Pipe Ends and Adapted to Be Pressed against the Surfaces of the Tubes by the Housing Parts. A. W. Sutton, Wolverhampton, Stafford, England.

412,738. Bonded Abrasive Article Including a Bonded Abrasive Body, a Rigid Metal Supporting Means, and an Intermediate Cementing Layer therebetween Consisting of Polychloroprene Compounded with a Substantial Amount of Filler Such as Carbon Black and Having an Adhesive Strength with Respect to the Bonded Abrasive Body and the Metal Supporting Means Substantially in Excess of that of the Rubber Bonds Similarly Employed. Carborundum Co., assignee of Garret Van Nimwegen, both of Niagara Falls, New York, U. S. A.

412,739. Abrasive Article Including a Bonded Abrasive Body, a Rigid Metal Supporting Means, and an Intermediate Cementing Layer Adhesively Uniting the Abrasive Body and the Metal Supporting Means; the Intermediate Layer Comprises a Copolymer of Butadiene and Acrylonitrile and Contains a Substantial Amount of Filler. Carborundum Co., assignee of G. V. Nimwegen, both of Niagara Falls, N. Y., U. S. A.

412,752. Collapsible Container for Liquids, Comprising Rigid End Plates Secured to the Opposite Ends of a Tubular Body Portion of Flexible Material, Wherein the Body Portion Is Composed of or Contains Vulcanized Rubber, Rendered Self-Collapsing by Folds Vulcanized in the Wall of the Body Portion. Dunlop Rubber Co., Ltd., assignee of E. Stanton and G. C. Brentnall, all of London, England.

412,910. Vibration Insulating Mounting for Instruments and Similar Light Loads, Including a Support with an Aperture Formed with a Frusto-Conical Flange Projecting from the Support, and a Rubber Disc Having a Frusto-Conical Surface Formed on the Greater Diameter Portion. Dunlop Rubber Co., Ltd., London, assignee of E. A. Murphy, N. E. Hickin, and W. H. Hogg, all of Birmingham, all in England.

412,933. Floor Covering Including a Ply of Woven Fabric, a Ply of Sponge Rubber Pressed to One Side of the Fabric with Sufficient Pressure to Force Rubber into the Interstices of the Material and Vulcanized to the Fabric an Adhesive Coating over the Opposite Side of It. National Automotive Fibres, Inc., Detroit, Mich., assignee of H. P. Faris, Philadelphia, Pa., D. W. Yochum and R. B. Logan, both of Trenton, N. J., co-inventors, all in the U. S. A.

412,978. In a Package, a Wrapper Consisting of a Ply the Inner Surface of Which Is Rubber Hydrochloride, and a Tear Tape of Permanently Elongated Rubber Hydrochloride Film. Wingfoot Corp., Wilmington, Del., assignee of A. B. Clunan, Akron, O., both in the U. S. A.

PROCESS

United States

2,319,859. Preparing Compounded Rubber by Flowing Crude Rubber in Pellet Form and a Compounding Ingredient in Separate Measured Streams toward Each Other to Form a Combined Stream, Propelling the Materials of the Combined Stream, and Mixing and Kneading It Continuously While in Motion to Disperse Thoroughly the Compounding Ingredient in the Rubber, and after the Rubber and Compounding Ingredient Have Been Mixed Together, Subdividing the Moving Mass into Pellet Form. A. Hale, Akron, O.

2,319,918. Increasing the Transparency and Clarity of a Sheet or Film Prepared by Casting a Rubber Hydrochloride Solution onto a Smooth Surface and Drying, by Applying a Solution of a Transparent Film Forming Material Including an End Product Obtained by the Reaction of Rubber and a Halide Salt of an Amphoteric Metal in a Solvent Not for Rubber Hydrochloride and Evaporating the Solvent to Leave a Continuous Relatively Thin Pellicle over the Rubber Hydrochloride Sheet or Film. W. C. Calvert, Chicago, Ill., assignor to Wingfoot Corp., Wilmington, Del.

2,320,425. Combining Two Foamed Rubber Compounds by Vulcanizing One Compound at a Relatively High Temperature and Thereafter Vulcanizing the Other Compound at a Substantially Lower Temperature in Contact with the Vulcanized Compound. C. L. Glaes and J. F. Schott, assignors to Mishawaka Rubber & Woolen Mfg. Co., all of Mishawaka, Ind.

2,320,691. The Process of Altering Rubber Hydrochloride Stock Naturally Non-Elastic to a State of Rubber Hydrochloride Elastic so as to Preserve It in Such a State for Dry Storage for Subsequent Use without Fear of Deterioration by Exposure to the Elements, Which Consists in Heat Penetrating the Rubber by Heated Paraffin to Block Resistance thereof to Stretching, Thereafter Initially Stretching the Rubber, Removing Surface Paraffin, and Again Stretching the Treated Hydrochlorinated Rubber. L. M. Wright, Worcester, Mass.

2,320,937. Adhesively Uniting Rubber and Rubber-like Masses with Surfaces of Other Materials, by Applying a Coating of a Urea Aldehyde Condensation Product and an Iron Oxide to the Surfaces to Be United with the Rubber and Rubber-Like Masses and Applying Thereover a Coating of an Aqueous Rubber Dispersion and Hemoglobin to Form an Adhesive Layer, and Then Applying a Vulcanizable Rubber or Rubber-like Mass Thereover and Vulcanizing It. H. Knoop, Frankfurt a. m., and H. Miedel, Bad Homburg, von der Hohe, both in Germany, assignors to American Lurgi Corp., New York, N. Y.

2,321,319. Making Blown Rubber Articles by Providing a Preformed Hollow Article of Raw Rubber in a Plural-part Cavity Mold and Vulcanizing the Article under the Influence of Heat and Internal Fluid Pressure. D. G. Rempel, Barberton, O., assignor to Sun Rubber Co., Barberton, O.

2,321,552. Coagulating Latex by Adding Thereto Glycolic Acid as a Principal Coagulant, and Separating the Resultant Coagulated Rubber. H. A. Lubs, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,321,726. Making Tread by Forming a Ribbon of a Rubber-Like Material. S. W. Alderfer, assignor of one-half to E. D. Andrews, both of Akron, O.

CHEMICAL

United States

2,319,634. Composition Comprising a Synthetic Rubber Prepared by the Polymerization of a Butadiene-1, 3, and, as a Softener therefor, an Aliphatic Nitrile Containing an Open Chain of at Least Ten Carbon Atoms. D. E. Sauser, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,319,780. Electrically Insulating Material Having Mica Flakes Bonded Together with a Cementing Agent Consisting of a Heat Blended Mixture of an Alkyd Resin and a Polyvinyl Ester Selected from the Group Including Polyvinyl Acetate and Partially Hydrolyzed Polyvinyl Acetate. F. G. Pellett, Alplaus, N. Y., assignor to General Electric Co., a corporation of N. Y.

2,319,798. Product Comprising an Interpolymer of (1) a Polymerizable Unsaturated Alkyd Resin and (2) a Phthalic Di-ester of 2-Chloroallyl Alcohol in an Amount Corresponding to from 5-50% by Weight of the Mixed Components of (1) and (2). G. F. D'Alelio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,319,799. Polymerizable Composition Includ-

ing a Polymerizable Unsaturated Alkyd Resin and a Poly-(1-Halogenoally) Ester of a Polycarboxylic Acid. G. F. D'Alelio, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,319,826. Heat-Hardenable Adhesive Composition, the Resinous Component thereof Including, by Weight, from 10-50% of a Polyvinyl Acetate and from 50-90% of a Resinous Material. F. G. Pellett, Alplaus, N. Y., assignor to General Electric Co., a corporation of New York.

2,319,933. Substantially Permanent Tacky, Pressure-Sensitive Tape Made by Heating Together from One Part to 20 Parts by Weight of Paracoumarone Resin of a Softening Point not Substantially above 50° C. (Ring and Ball) and One Part by Weight of Chlorinated Rubber Having a Chlorine Content of from about 65-70%. E. G. Kerr, Leonia, N. J., assignor, by mesne assignments, to Allied Chemical & Dye Corp., a corporation of N. Y.

2,319,953. Heat Stabilizing Polymerized Masses Containing a Polymer of Vinyl Chloride by Adding to the Polymer One of the Group Consisting of the Alkali Metal, the Alkaline Earth Metal, and the Lead Phthalimides. W. Scott, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,319,954. Heat Stabilizing Polymerized Masses Containing a Polymer of Vinyl Chloride by Adding to the Polymer One of the Group Consisting of the Alkali Metal, the Alkaline Earth Metal, and the Lead Aryl Sulphonamides. W. Scott, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,320,649. Plastic Comprising a Relatively Small Percentage of Rubber Material and a Relatively Larger Percentage of a Moldable Plastic Product of Reaction, under Heat and Pressure, of Constituents of the Coffee Bean from Which a Substantial Part of the Oils Has Been Removed. H. S. Polin, New York, N. Y.

2,320,716. Adhesive Composition Composed Essentially of Rubber, White Mineral Oil, and a Tack-Imparting Content of Beta-Pinene Polymers Melting within the Approximate Range of 80-150° C. and Compatible with the Rubber and Mineral Oil. F. W. Corkery, Crafton, and S. G. Burroughs, Pittsburgh, both in Pa., assignors to Pennsylvania Industrial Chemical Corp., a corporation of Pa.

2,320,745. Incorporating in a Rubber Composition an Antioxidant Consisting of a 1, 3-Diaryl, 1,3-Dialkyl Cyclobutane in Which One of the Aryl Groups Is Directly Connected in the Para Position, to the Secondary Amino Nitrogen Atom of the Group—NH—R, Where R is an Aryl Radical. P. T. Paul, Naugatuck, Conn., assignor to the United States Rubber Co., New York, N. Y.

2,320,746. Preserving Rubber Compositions by Incorporating Therein a Product of Acid-Catalyzed Reaction of a Polyhydric Phenol and an Aliphatic Diene Hydrocarbon. P. T. Paul, Naugatuck, Conn., assignor to United States Rubber Co., New York, N. Y.

2,320,924. Uniformly Translucent Cast Objects of a Polymer from the Group Consisting of Polystyrene and Polyvinylacetate, and a Polymer from the Group Consisting of the Polymeric Lower Esters of Acrylic and Methacrylic Acids, the Object Comprises a Fine Dispersion of at Least One Member of One of the Groups in a Continuous Phase of at Least One Member of the Other Group. W. H. Gift, Bristol, Pa., assignor to Röhm & Haas Co., Philadelphia, Pa.

2,321,028. Opalescent Resin Resulting from the Polymerization of a Mixture Including a Polymer Component Essentially Consisting of Methyl Methacrylate Polymer, Styrene Monomer, and of a Second Monomer from the Group Consisting of Methyl Methacrylate, Methyl Acrylate, Vinyl Acetate, and N-Butyl Methacrylate Monomers. C. E. Schildknecht, Bloomfield, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,321,111. Forming Foamed Rubber by Beating to a Foam a Sulphur-Vulcanizable Rubber Latex Mixture Containing Additions of Both Anionic and Cationic Long-Chain Compounds, Each Having at Least Six Carbon Atoms; the Compounds Are Such That the Resultant Foam Is Capable of Withstanding Drying, Is Sufficiently Fluid to Be Poured, and the Composition Is Maintained Negatively Charged. P. Stamberger, assignor to International Latex Corp., both of Dover, Del.

2,321,114. Recovering Textile Material from a Mixture of the Textile Material with Solvent Resistant Rubber, Includes Digesting the Mixture at a Temperature between 120° and 160° C. with Sulphur, a Reverting-Type Vulcanization Accelerator, and Sufficient Rubber Solvent to Dissolve the Rubber in the Presence of the Sulphur and Accelerator, Continuing the Digestion until the Rubber Is Dissolved in the Solvent, and Then Mechanically Separating the Textile Material from the Resulting Solution. R. F. Tefft, Rochelle Park, N. J., assignor, by mesne assignments, to Allied Chemical & Dye Corp., a corporation of N. Y.

Dominion of Canada

412,531. Coating Composition Including the Reaction Product of Rubber with a Reagent from the Group Including Chlorostannic Acid and a Halide of an Amphoteric Metal, an Aliphatic Solvent, an Aromatic Solvent, and a High Molecular Weight Crystalline Material Soluble in Mixtures of Aromatic and Aliphatic Solvents and Not More Than Slightly Soluble in the Rubber Reaction Product and the Aliphatic Solvent. R. V. Sandstrom, Moline, Ill., U. S. A.

412,568. Clear, Heat Resistant Composition Including a Vinyl Resin Having a Vinyl Halide Polymerized Therein, Intimately Combined with a Stabilizing Amount of a Product Resulting from Heating One of the Group Consisting of the Lead and Cadmium Salts of the Lower Fatty Acids with an Alkali Metal Salt of These Acids. Carbide & Carbon Chemicals, Ltd., Toronto, Ont., assignee of D. M. Young and W. M. Quattlebaum, Jr., co-inventors, both of Charleston, W. Va., U. S. A.

412,875. Resin Adapted for Optical Uses, Including a Copolymer Derived from a Base Substance Selected from the Class Including Polymerizable Vinyl Esters and Polymerizable Esters of Acrylic Acid and Alpha Substituted Acrylic Acid. Canadian Industries, Ltd., Montreal, P. Q., assignee of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., assignee of Norton Co., assignee of C. E. Barnes, both of Worcester, Mass., both in the U. S. A.

412,876. Synthetic Resin Comprising a Copolymer of a Substance Selected from the Group Consisting of Acrylic Anhydride and the Alpha Substituted Anhydrides Copolymerized in Miscible Proportions with at Least One Compatible Polymerizable Base Substance of the Formula RCH : CR₁ — X Where R and R₁ Are Selected from Hydrogen and Monovalent Alkyl and Aryl Radicals and X Is Selected from Hydrogen and Radicals of the Class Consisting of Esters, Amides, Aldehydes, Ketones, and Ethers. Canadian Industries, Ltd., Montreal, P. Q., assignee of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., assignee of Norton Co., assignee of C. E. Barnes, both of Worcester, Mass., both in the U. S. A.

412,877. Optical Body Formed of a Polymerized Base Substance Comprising Methyl Methacrylate Copolymerized with Approximately 15% of a Substance Selected from the Group Consisting of Vinyl Formate and Isopropenyl Formate, Which Has Accurately Shaped Optical Surfaces. Canadian Industries, Ltd., Montreal, P. Q., assignee of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., assignee of Norton Co., assignee of C. E. Barnes, both of Worcester, Mass., both in the U. S. A.

412,878. Interpolymer Obtained by Polymerizing a Mixture of 10-90% of Asymmetrical Dichloroethylene, 5-50% of a Polymerizable Component from the Group Including Methyl, Ethyl, Phenyl, Cyclohexyl, and p-Cyclohexyl Phenyl Methacrylates, Styrene Acrylonitrile, Methacrylonitrile, Methacrylic Acid, Methacrylic Amide, Methacrylic Anilide, and Phenyl Vinyl Ketone, and 5-30% of a Polymerizable Component from the Group Consisting of the Vinyl Esters of Lower Aliphatic Acids, the Esters of Acrylic Acid, the Higher Open-Chain Aliphatic Monohydric Alcohol Esters of Methacrylic Acid, and Methyl Vinyl Ketone. Canadian Industries, Ltd., Montreal, P. Q., assignee of H. W. Arnold, Marshallton, Del., U. S. A.

412,881. Process Which Includes Reacting an Organic Compound Containing, as the Sole Reacting Groups, a Plurality of Separate and Distinct Groups Having the Formula — X = C = Y, Wherein X Is a Member of the Class Consisting of —C and N, and Y Is a Member of the Class Consisting of O, S, and NR, Where R is a Member of the Class Consisting of Hydrogen and Monovalent Hydrocarbon Radicals, with an Organic Substance Having a Plurality of Groups Containing Reactive Hydrogen. Canadian Industries, Ltd., Montreal, P. Q., assignee of W. F. Hanford and D. F. Holmes, co-inventors, both of Wilmington, Del., U. S. A.

412,882. Treating a Crude Polyvinyl Acetal Resin by Steeping It in Finely Divided Form in a Steeping Liquid Including Essentially an Aqueous Solution of an Alkaline Substance from the Group Having Alkaline Metal Hydroxides and Tertiary Amines. Canadian Industries, Ltd., Montreal, P. Q., assignee of B. C. Bren, Verona, and J. H. Hopkins and G. H. Wilder, both of Arlington, co-inventors, both in New Jersey, U. S. A.

412,883. Treating a Crude Polyvinyl Acetal Resin, Including Steeping It in Finely Divided Form in a Steeping Liquid of Water and a Water-Miscible Solvent and an Alkaline Substance from the Group Including Alkali Metal Hydroxides and Tertiary Amines. Canadian Industries, Ltd., Montreal, P. Q., assignee of J. H. Hopkins and G. H. Wilder, co-inventors, both of Arlington, N. J., U. S. A.

412,886. Making Resins, by Heating in the Presence of a Catalyst a Reaction Mixture Including Essentially a Monohydric Aliphatic Alcohol and the Reaction Product of Urea and Formaldehyde. Canadian Industries, Ltd., Montreal, P. Q., assignee of D. E. Edgar, Philadelphia, Pa. U. S. A.

412,893. Treating, at 50-125° C., the Butyral of Polyvinyl Alcohol with 0.1-5%, Based on the Weight of the Resin, of Hexamethylene Diisocyanate. Canadian Industries, Ltd., Montreal, P. Q., assignee of G. L. Dorough, Niagara Falls, N. Y., U. S. A.

United Kingdom

552,715. Ether-Esters of Hydroxy-Succinic Acid and Polymers Derived therefrom. Imperial Chemical Industries, Ltd., (E. I. du Pont de Nemours & Co., Inc.).

552,738. Coating Compositions Containing Polyhydric Alcohol-Polybasic Acid Resins. Imperial Chemical Industries, Ltd., (E. I. du Pont de Nemours & Co., Inc.).

552,739. Alcoholates. Imperial Chemical Industries, Ltd., (E. I. du Pont de Nemours & Co., Inc.).

552,997. Aminotriazine - Aldehyde Resinous Condensation Products. American Cyanamid Co.

MACHINERY

United States

2,320,778. Vulcanizing Apparatus Including a Mold Section Adapted to Receive a Portion of a Tire with an Inner Tube and Having a Bead Plate to Engage the Beads of the Tire. I. N. Herman, Chicago, Ill.

2,321,163. Apparatus for Stitching Sheet Material to a Driven Building Form Having a Side Forming Face, the Apparatus Including a Rotatable Stitching Member Mounted for Free Rotation in One Direction, and Means for Driving the Member in Such Direction While Permitting Free Rotation of the Member Faster Than the Driving Speed. F. S. Sternad, Cuyahoga Falls, and J. P. Sapp, Kent, both in O., assignors to B. F. Goodrich Co., New York, N. Y.

2,321,340. Mold for Rubber Articles Comprising a Member Having a Dome-Shaped Central Portion, with a Plurality of Spaced Annular Grooves of Progressively Varying Depth Surrounding the Central Portion, the Grooves Being of Generally Rectangular Cross-Section, and a Coacting Mold Member Having an Open Portion Bridging the Grooves. C. C. Waterbury, Chicago, Ill.

Dominion of Canada

412,612. Tire Bead Reenforcement Including a Braided Wire Tape Curved Edgewise. National-Standard Co., Niles, Mich., assignee of F. J. Shook, Akron, O., both in the U. S. A

412,934. Making a Floor Covering by Calendering an Unvulcanized Blowing Rubber Stock to the Under Side of an Open Woven Fabric so as to Force the Stock into the Openings in the Fabric. National Automotive Fibres, Inc., Detroit, Mich., assignee of H. P. Faris, Philadelphia, Pa., D. W. Yochum and R. B. Logan, both of Trenton, N. J., co-inventors, all in the U. S. A.

413,012. Apparatus for Use in Forming a Finish Bead at the Edge of Uncured Sheet Rubber. Archer Rubber Co., assignee of W. F. Gowdy, both of Milford, Mass., U. S. A.

UNCLASSIFIED

United States

2,319,956. Packaging Molten Process Cheese in a Rubber Hydrochloride Film by Lining an Outer Rigid Container with a Rubber Hydrochloride Bag of the Envelope Type. J. E. Snyder, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,319,959. Adhesive Composition Including a Polyisobutylene Elastomer and a Pale Solid Hydrogenated Resin of the Class Consisting of Hydrogenated Indene Resins, Coumarone Resins, Dicyclopentadiene Resins and Combinations thereof. H. J. Tierney, Mahtomedi, Minn., assignor to Minnesota Mining & Mfg. Co., St. Paul, Minn.

2,320,375. Laminated Non-Glare Safety Plate Including a Pair of Relatively Thin Sheets of Light Transmitting Medium, a Layer of Polyvinyl Acetal Containing Castor Oil as a Non-Solvent Plasticizer Adherent to the Inner Face of Each of the Sheets. H. R. Moulton, assignor to American Optical Co., both of Southbridge, Mass.

2,320,536. Preparing a Coated Sheet of a Thermoplastic Resin by Partially Polymerizing in the Presence of Organic Peroxides, a Compound Having Two Polymerizable Unsaturated Groups Separated by at Least One Oxygen Linkage. M. A. Pollack, F. Strain, and I. E. Muskat, all of Akron, O., assignors to Pittsburgh Plate Glass Co., Pittsburgh, Pa.

2,321,422. Coated Abrasive Article Consisting of a Backing and a Surface Layer of Abrasive Grains Attached thereto by a Binder Comprising the Water-Soluble Neutralization Product of a Water-Soluble Alkali and a Polymer of a Plurality of Unsaturated Monomers Including an Acrylic Acid. N. P. Robie, assignor to Carborundum Co., both of Niagara Falls, N. Y.

EUROPE

GREAT BRITAIN

Concentration and Purification of Latex

A new method of concentrating and purifying latex, claimed to yield a product with properties very similar to those of centrifuged latex, was discussed by E. A. Murphy, of Dunlop Rubber Co., Ltd., before the London Section of the Institution of the Rubber Industry late in 1942. This process, known as electrodecantation, is based on phenomena observed by Pauli and his co-workers on the behavior of colloidal sols when subjected to electrodialysis. It was found that in purifying sols, such as silicic acid and serum albumen by electrodialysis between vertical semi-permeable membranes, superimposed layers of different degrees of concentration were frequently obtained; the more concentrated layers were uppermost or the reverse, according to the relative densities of the sol and the dispersing medium.

It is suggested that this stratification is the result of the combined influence of the electrical potential and gravitational forces under suitable conditions. The influence of the electric field causes the colloidal particles to concentrate at the membrane surface; but if this influence is not too great, the gravitational force will prevent deposition on the membrane and cause the concentrated layer of particles to move upward or downward along the surface of the membrane, depending on the relative density as compared with the surrounding liquid. At the same time the sol at the other membrane becomes more dilute and moves in a direction opposite to that of the stream at the first membrane, and eventually the dispersions of different concentration spread out through the cell liquid in horizontal layers which can be decanted.

Pauli and Stamberger then studied the behavior of aqueous dispersions of rubber under these conditions. When latex is subjected to electrophoresis, thick depositions are obtained at the anode or on the semi-permeable wall of a cell containing the anode and a suitable electrolyte. By adjusting the electrical potential and the initial concentration of the latex, deposition of the accumulating particles on the membrane can be prevented, and, similar to the behavior of the sols, there is free movement of the concentrated layer and eventually a separation of the latex into an upper layer containing the bulk of the rubber particles and a layer of serum.

Tests showed that the lower the initial concentration of the latex and the electrical potential employed, the more efficient the separation, but at the cost of a progressive reduction in the layer formation. It was found, however, that if the current is periodically reversed during the process, potentials which would normally cause deposition could be employed, and thus the rate of separation could be increased without fear of membrane deposition. To achieve this, direct current with mechanical means of reversal is used, as the frequency of the commercial alternating current is too high for this purpose.

Apart from the effect of current and initial concentration of latex on the degree of separation, other factors must be considered, as temperature, magnitude of the charge on the particle, and the nature of the absorbed layer of non-rubber constituents on the surface of the particle.

The migration velocity of the particle depends on the magnitude of the charge on its surface, and if the dispersion is near the isoelectric point, little separation occurs. It is therefore sometimes useful to increase the charge where possible in order to obtain a high rate of separation with low current consumption. In the case of rubber latex this can be effected by increasing the ammonia content; polar substances which are also emulsifying agents (as lipines, cholesterols, salts of cholic and choleic acids, and some of the wetting agents for textiles) have similar effects; other suggested aids to separation are long-chain compounds containing hydrophillic groups, self-emulsifying substances as diglycol stearate, sorbitol monostearate, etc.

The charge on the particles of certain synthetic rubber dispersions is frequently low, and unless suitable aids to separation are used, layer formation is poor.

Naturally special apparatus has been developed for this process, and the efficiency and speed of concentration by electrodecantation have been considerably raised by improvements in designs. Thus the number of diaphragms between the electrode compartments was greatly increased, and in practice as many as 150 membranes are now used in a single unit. Efficiency is further aided by arranging the units in batteries all fed from the same latex supply and with a common current-reversal system.

Electrodecantation offers certain advantages over the usual methods of centrifugation and creaming. First is the very high degree of separation; under production conditions the loss of rubber rarely exceeds 1%; whereas with centrifugation the proportion of rubber in the skim may be as high as 7%. Loss of output due to stoppages for cleaning purposes is much less than with centrifugation, as the periods between cleaning operations are much longer. Compared with the creaming process, the degree of separation with electro-decantation is also favorable; while, moreover, the disadvantage of traces of creaming agent remaining in the latex is avoided. Again with the new process, as with centrifugation, there is little tendency of further separation of the latex during prolonged storage, not always the case with concentrates obtained by creaming.

As has already been pointed out, the properties of latex prepared by the new method are very similar to those of centrifuged latex, as the following data show:

	Once Centrifuged Latex	Once Electro-Creamed Latex	Twice Centrifuged Latex	Twice Electro-Creamed Latex
Alkalinity (% NH_3)	0.63	0.59	0.67	0.66
Total solids, %	61.30	61.40	61.70	61.80
Dry rubber content, %	59.70	59.80	61.50	61.50
Ash, %	0.45	0.40	0.14	0.14
Nitrogen content	....	....	0.22	0.23
Color of latex	Grade 1	Grade 1	Grade 1	Grade 1
Color of film (Lovibond units)				
Unaged	1.50	1.00	1.00	1.00
Aged 16 hrs. at 95° C.	2.50	2.50	1.25	1.50
Z. O. T. stability	64.00	63.00	14.00	15.00

Institution of the Rubber Industry

A meeting of the Midland Section of the Institution of the Rubber Industry was scheduled for Birmingham on April 29, when D. Parkinson was to have presented a paper, "The Effect of Diameter and Surface Area of Carbon Black on Certain Properties of Rubber Compounds."

The IRI London Section held its nineteenth annual general meeting on April 12, when various films were shown including "The Story of the Rubber Tree", "Latex in War Time", and "A New World through Chemistry", a new color film on synthetics.

A paper, "Rubber in the Present Emergency", by E. E. B. Owen, won first prize in the competition for David Spence's award for the best essays on "Rubber in the Present Emergency." Second prize went to N. G. Hiscox for his essay, "Rubber in Relation to the War Effort", which discussed synthetic rubber. The first paper was read March 23 before the Manchester Section.

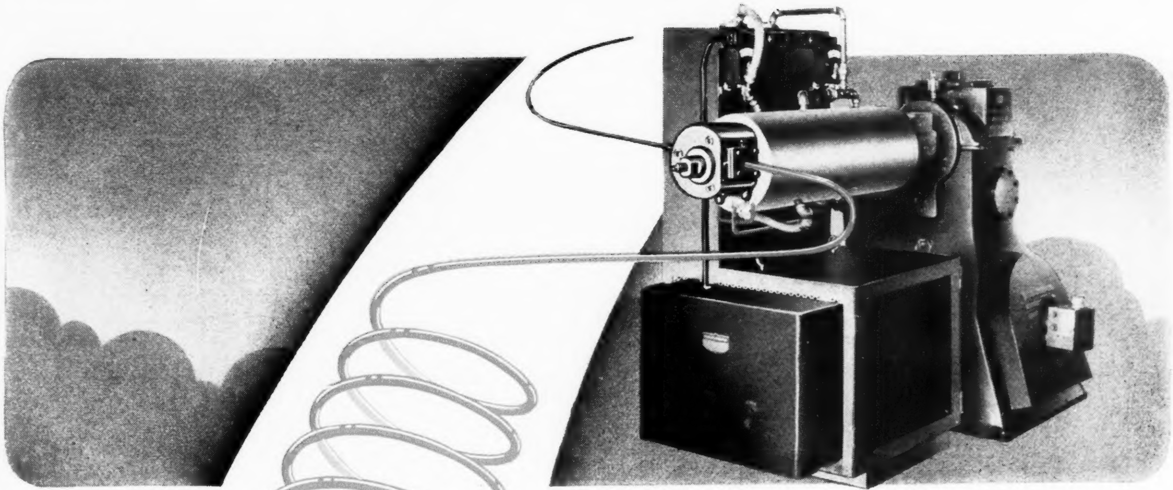
At a joint meeting of the above section and the Rheological Club, held April 17, three papers were presented: "The Behavior of Rubber in Elongation, Compression, and Shear", by L. R. G. Treloar, of the British Rubber Producers' Research Association; "The Position of the Rubber-Like State on the Plastic-Elastic Scale", by J. M. Buist and R. C. Seymour, of Imperial Chemical Industries, Ltd.; and "Rheological Problems in the Rubber Industry", by J. R. Scott, of the Research Association of British Rubber Manufacturers. Later in the day, those who attended the meeting visited the rubber laboratories of Imperial Chemical Industries (Dyestuffs Group).

British Notes

At the annual meeting of the Rubber Growers' Association on May 4, Harold F. Copeman was reelected chairman, and H. B. Egmont Hake was elected vice chairman.

Cellon Plastics, Ltd., has been formed to manufacture and deal in plastics, plastic materials, cork and cork substitutes, modeling and bonding materials, etc. The capital is £10,000 in £1 shares.

Enfield Cable Works reported net profits of £166,623 for 1942 against £217,039 for 1941. A final ordinary dividend of 6¼% was declared; dividends for the year totaled 12½%, the same as in the preceding year. The company states that output as well as profits decreased as compared with both 1940 and 1941 as a result of the necessity of producing rubber-insulated cable without crude rub-



ber; furthermore the demand was smaller for the larger and more profitable types of cable; while, on the other hand, the company had to face the expense of the gradual reorganization at the factories which had been started in 1941, as well as the costs involved in adapting machinery to new purposes.

A new Ministry of Supply order restricts the amount of crude rubber, reclaim, and zinc oxide that may be used in compounds for soles and heels; for many types of soles and heels no crude rubber at all may be used; the kind of sheeting that may be manufactured and the maximum thickness of half-soles, heels, and heel tips have been prescribed.

The authorized capital of British Insulated Cables is to be raised from £3,000,000 to £4,000,000. It is thought that this increase is an indication that the company is to continue to extend its activities beyond cablemaking, as it has been doing for some time. Profit for 1942 was £557,180, against £547,348 in 1941.

The Goodyear Tire & Rubber (Great Britain) Co. announced profit of £148,008 for 1942, as compared with £111,864 in the preceding year. The ordinary dividends paid during the year totaled 12½%, against 10% in 1941.

SOVIET RUSSIA

Until 1936 the Russian rubber industry made thread of natural rubber exclusively, but about this time it decided to attempt to replace the imported rubber by Russian synthetic or home-grown rubber. The first series of tests were made with SKB (sodium butadiene rubber); the compounds used consisted of 100% synthetic rubber. Threads made from these compounds showed good tensile strength, but relative elongation did not exceed 400-500%, quite unsatisfactory for thread. Trials were then made with combinations of natural rubber and sodium butadiene rubber in various proportions, but here too the results were unsatisfactory, chiefly because the sheets produced from the compounds were not so homogeneous as they appeared to be, and when they were cut up into threads, lumps showed up which naturally had an adverse effect on tensile strength.

At the works of the Krasnaya Treugolnik thread was produced in quantity from the Russian equivalent of neoprene-Sovprene. It was found that to obtain smooth, thin rubber threads from Sovprene, the sheeting must take place only on cold calenders; incidentally, Sovprene sheet vulcanized more than twice as fast as natural sheet. After the former was cured, it was shellacked before being cut up into threads, operations which offered no more difficulties than are encountered in making the usual kind of rubber thread. After cutting, separating, and washing in alkali to remove the shellac, the Sovprene threads and some made of natural rubber were subjected to comparative tests.

The Sovprene compound had a tensile of 150 kg/cm² (2,140 psi) relative elongation was 880%, and permanent elongation, 15%; while the tensile of the natural rubber was 160 kg/cm² (2,280 psi) relative elongation was 830%, and permanent elongation 10%. The physical properties of threads of certain sizes made from these rubbers follow:

NATURAL RUBBER

Caliber Mm.	Width of Thread Mm.	Relative Elongation %	Breaking Strength Grams	Permanent Elongation %
0.88*	0.76	919	700	4
0.87	0.79	927	640	4
0.87	0.76	921	660	4
0.78	0.76	929	700	4
0.83	0.83	925	600	4

SOVPRENE RUBBER

Caliber Mm.	Width of Thread Mm.	Relative Elongation %	Breaking Strength Grams	Permanent Elongation %
0.85	0.73	913	700	7
0.85	0.74	813	640	6.5
0.84	0.78	994	560	7
0.85	0.75	928	640	7
0.85	0.75	958	520	10

* About size 30 thread.

It will be seen that the permanent elongation of the threads made of Sovprene rubber is consistently higher than that of the natural rubber threads.

A sample lot of the Sovprene thread was sent to a customer who returned a satisfactory report on the quality. However the Sovprene threads had a strong odor; consequently work on this type of thread was stopped until a quantity of odorless Sovprene could be obtained.

But the work on making thread from other than imported natural rubber was not abandoned. A new series of tests was started in which *tau-saghyz* and *kok-saghyz* provided the basic raw material. The compounds made with *tau-saghyz* rubber showed tensile strength, kg./cm.^{2} of 118 (1,680 psi); relative elongation of 700%, and permanent elongation of 20%. The best compounds made of *kok-saghyz* rubber showed tensile of 165 kg./cm.^{2} (2,350 psi); relative elongation, 890%, and permanent elongation, 19%. No figures are given as to the properties of thread made from *tau-saghyz* rubber, but the values for *kok-saghyz* thread follow:

Caliber Mm.	Width of Thread Mm.	Breaking Strength Grams	Relative Elongation %	Permanent Elongation %
0.88*	0.82	580	811	4
0.84	0.82	640	878	3
0.80	0.75	540	814	3.5
0.89	0.86	580	760	4
0.89	0.75	540	764	3

* About size 30 thread.

The curing time for the *kok-saghyz* rubber was discovered to be much shorter than for natural imported rubber. A large quantity of thread was made from *kok-saghyz* rubber and sent to various textile factories which reported favorably on the threads. The tests indicated that *kok-saghyz* will yield threads not inferior in quality to those of natural rubber.

HOLLAND

From Holland via England comes the report of a new method of packing plantation and synthetic rubber perfected about 1940, when a trial bale of crude rubber packed in the new way was shipped from Netherlands India by Spoon to Amsterdam and eventually reached A. van Rossem.[1]

Finding a suitable packing for plantation rubber has for many years occupied the minds of growers and manufacturers alike, and the subject has been attacked from many angles, without satisfactory solution so far. Packing in plywood chests has been the most usual method in spite of the fact that the chests were heavy, bulky, and expensive, and that splinters got into the rubber and that sampling was troublesome. It was attempted to avoid these difficulties by baling, and various methods of doing this have been suggested from time to time. One of the latest systems to be advocated before Pearl Harbor was bareback wrapping in an outer sheet of rubber, by which money, space, and material would be saved. The method was much discussed, but in practice the wrapping proved too soft to withstand the rough handling in the course of shipping and unloading; furthermore it stuck so firmly to the rubber it enclosed as to be extremely difficult to remove; finally it picked up so much dirt and foreign material that its value for further use was greatly impaired.

The Dutch rubber experts in the Far East set about developing a wrapping that would be sufficiently tough and less adherent, and found that this could be achieved by mixing a large amount of carbon black with the rubber. They therefore made wrapping sheets of 57% rubber and 43% carbon black, compounding the mixture at 140° C. to obtain proper dispersion of the carbon black. These sheets had a strength of 60 kilograms per square centimeter (860 psi), which is sufficient to resist the rough treatment during the long voyage from plantation to factory; furthermore the considerably toughened surface not only picked up much less dirt, but could easily be dried if it got wet, and reached the factory in a condition that made it fit for use in a black master batch. A further advantage was that the wrapper did not stick so tenaciously to the inside rubber and could be removed with comparative ease. The method is said to be useful not only for natural, but also for synthetic rubber; the latter, by the way, is usually packed in sacking by the Germans.

[1] *Chem. Weekblad*, 38, 25, 333 (1941).

GERMANY

I. G. Farbenindustrie, A.G., it appears, has not stopped the search for more suitable means of plasticizing Buna S than have so far been available. The company attempted to use peptizers comprising asymmetric derivatives of hydrazine.[1] These substances, however, are not only highly toxic, but their action is almost too powerful to be controllable. It was then sought to overcome these defects by combining the asymmetric hydrazines with aldehydes and ketones; this work has apparently succeeded, for it is claimed that the resulting products are non-toxic while their action can be exactly controlled.

Domestic sources indicate that Germany is busily engaged in reconstructing and repairing chemical plants in occupied countries in eastern Europe. In the Reich Kommissariat Ostland, which includes the Baltic states and White Russia, the entire industry is said to be in operation again and more than 200 factories are claimed to be working in the Ukraine. Since at the same time a serious shortage of raw materials is admitted, many of these factories must at present be producing considerably below capacity, if at all.

H. Staudinger, well known for his work on micro-molecular chemistry, has become editor of *Journal für Praktische Chemie*, a periodical devoted especially to research work on the chemistry of high polymers.

On his sixty-first birthday, last March, Erich Bobeth was awarded the iron cross by Hitler in recognition of his success in reorganizing the French tire industry. Dr. Bobeth was for many years connected with the tire research division of the Continental Gummiwerke, Hannover, and in 1935 became manager of the firm's tire factory. He left in 1936 for a similar position with the Gummiwaren Fabrik Phoenix, a post which he apparently still holds despite his appointment as *Kommissar* in charge of the French tire industry in 1940 soon after France fell.

[1] D. R. P. 702, 209.

FRANCE

Via the German press it is learned that all the rubber associations formerly existing in France have been united in a single new body, Comité Interprofessionel du Caoutchouc. It will take care of the interests of manufacturers and control prices, but its actions and decisions are subject to the Vichy Government.

At The Institut Français du Caoutchouc, now directly controlled by the Nazis, A. Demongeot has been working on a design for a new rubber-tired vehicle which can easily be converted for military service.

CEYLON

The distribution in Ceylon of certain materials including formic and acetic acid is now controlled. The Rubber Commissioner in Ceylon has been appointed controller of these acids, and it is forbidden to import, sell, buy or otherwise acquire these materials without a special permit from him. The Controller will also fix maximum wholesale and retail prices.

The Government of Ceylon proposes to undertake the retreading of essential service tires and to manufacture camelback. The plant of the Ceylon Tire Rebuilding Co. will be used to make the camelback. The measure has been under consideration because apparently the products turned out by most of the Ceylon enterprises (and there seem to be several) do not come up to government standards. It has even been suggested that the government take over the entire retreading business of the island, and naturally those who would be affected, as well as a section of the public, are criticizing the government, rather bitterly

pointing out that it is the part of government to encourage, and not obstruct private enterprise.

It has been proposed to raise the price of rubber to one rupee (about 30c) a pound, and the Executive Committee of Agriculture and Lands has reported to the Ceylon State Council that it approves this price.

In connection with the request to rubber planters in Ceylon and India to increase output by applying so-called "slaughter tapping", by which the trees would receive two cuts every other day instead of one, it is learned that the method would apply to about 20% of the rubber estates. Since it is recognized that the system would permanently damage trees and shorten their lives considerably, it is proposed to compensate rubber planters. Ceylon planters adopting the scheme would receive compensation after two years, and planters in India, as soon as they wished to plant new trees.

BRAZIL

From the Empresa seringal[1] in the Acre region comes the report that some rubber gatherers there are starting a factory to produce sheet rubber. The local Department of Production is assisting in this undertaking.

The relatively undeveloped, but rich state of Matto Grosso, believed to have vast numbers of wild rubber trees, is to be opened up. On July 15, escorted by soldiers and representatives of the Indian Protection Department, a caravan of men familiar with jungle life will set out on a 1500-mile trek to the interior. Matto Grosso is nearer to the overland railroad and the Port of Santos than the Amazon territory, and it is hoped that it will prove possible to obtain enough rubber from the Matto Grosso State to supply local rubber manufacturers, leaving the Amazon rubber to be exported to the United States.

While this scheme is being put into effect, reports from Belem indicate that thousands of men who have undertaken to go to the Amazon region to tap rubber are now being held up at the port because there are not enough ships to take them to their destination. It had been planned to rush 50,000 men to the interior to gather rubber, but so far not more than 8,000 have been put to work there because of lack of transportation. The United States, it seems, will help in this emergency by supplying a fleet of small river boats.

[1] Rubber producing area.

Editor's Book Table

BOOK REVIEWS

"A.S.T.M. Standards — 1942 — Including Tentative Standards. Part III. Non-Metallic Materials—General." Published by the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa. Cloth, 6x9 inches. 1725 pages, 345 standards. Indexed. Price $9.

The 1942 Book of A.S.T.M. Standards, issued in three parts, contains in their latest approved form all of the Society's widely used specifications and tests for materials, definitions, and recommended practices. The three volumes of the latest edition have 1090 specifications and standard methods which cover more than 4900 pages. Some idea of the large increase in the size and coverage of these volumes may be seen from the figures for the 1939 volume which had 866 standards on 3700 pages. Publication is triennial with supplements issued for *each* part in *each* of the intervening years. Continuing the policy first used with the 1939 edition, all specifications, whether formal or tentative, are given. In addition Emergency Standards issued by the Society in accordance with a special procedure in the interest of expediting procurement or conservation of materials during the period of national emergency appear in a pink-colored insert section, and Emergency Alternate Provisions applying to the standards in this book are published on individual stickers and furnished for attachment to the standards in question.

Part III, which is specifically referred to here, has specifications and tests on rubber products (40), coal and coke (27), petroleum (89), electrical insulating materials (61), plastics (21), textile materials (73), paper and paper products (23), soaps and other detergents (30), naval stores (7), water (8), and thermometers and general tests (13). The section on rubber and rubber products has standards on fire hose, belting, gloves, matting, tape, wire and cable, cements, sponge rubber, hard rubber, analysis, tension, accelerated aging, abrasion, adhesion, set, hardness, and light checking.

"Trees and Test Tubes." Charles Morrow Wilson. Published by Henry Holt & Co., New York, N. Y. Cloth, 5½ x 8½ inches. 342 pages. Price $3.50.

Within the past couple of years so much has been published about rubber, factual and otherwise, in newspapers, magazines, and books, that Mr. Wilson's latest book may be classed as anti-climactic rather than timely. An experienced writer, he has done much research in the field, but the material he has gathered can hardly be said to be an important addition to rubber literature. At the outset he devotes considerable space to the cultivation and handling of *Hevea* and other types of natural rubbers and gives close to a hundred pages to the life and work of Charles Goodyear and less space to others who had to do with the introduction of rubber into commerce. He is somewhat skeptical of the value of synthetic rubbers; the book antedates the real progress in the development of those various synthetic products. The author closes with a summary of the Baruch Report and finally the complete report together with an exhaustive bibliography and references that reflect his thorough research work. To the rubber man Mr. Wilson's book may appeal as a memory refresher, and for quick reference on occasion, though some of the conclusions and even the formulae for making tires and tubes are quite of the past. To the layman it may offer a quick survey of the rubber situation, most of it presented in entertaining style.

"Chemical-Technical Dictionary (German-English-French-Russian)." A. W. Mayer. Translated under the direction of B. N. Menshutkin and M. A. Bloch. 1942. First American Edition. Chemical Publishing Co., Inc., Brooklyn, N. Y. 870 pages. Price $8.

This dictionary is recommended for use by those who wish to study German, French, and Russian chemical literature, but actually because of its arrangement and lack of cross-references is limited in its application to the translation of literature writ-

ten in German. The words are arranged alphabetically in German followed by the English, French, and then the Russian translation; therefore the use of this dictionary by anyone having a knowledge of the last three languages, but without a knowledge of German would be difficult, if not impossible. In addition some of the translations between the four languages are not consistent. *Gummi-ball* is called rubber ball in English, which is not consistent with the French and Russian translations as a rubber bulb, as in a rubber bulb syringe. The latter translations are correct. Similarly, *gummi-sauger* in English and French is called a rubber suction ball, and only in the Russian is the correct translation as a rubber nipple found. Also, *gummi-faden* in English is called a rubber strip, which is not so good as the French and Russian translations in which it is correctly called rubber thread.

There is a definite need of a dictionary of this sort, and the large amount of material in this volume, if arranged efficiently, would be of much value.

NEW PUBLICATIONS

"Sterling—A Semi-Reenforcing Furnace Black—Characteristics in Natural Rubber and GR-S (Buna S)." Godfrey L. Cabot, Inc., Boston, Mass. 32 pages. Comparisons of this new semi-reenforcing furnace black with another black of the same type, easy-processing channel block, and a medium thermal black in natural rubber and GR-S are presented in this bulletin. The tests made include tensile strength, 400% modulus, elongation, Shore hardness, T-50, tear resistance, rebound, torsional hysteresis, compression set, and heat generation. Oxygen bomb aging tests were made on some of the natural rubber stocks, and heat embrittlement tests on all the GR-S stocks. The essence of these tests is presented in a concise, graphic form; while the tabulations which follow contain the detailed results.

"Perbunan Compounding and Processing." Stanco Distributors, Inc., Chemical Products Department, 26 Broadway, New York, N. Y. Second Edition. 100 pages. This comprehensive loose-leaf manual provides the latest information on the use of Perbunan (Buna N) synthetic rubber. In addition to an introduction in which the general properties and applications of this rubber are explained and a general discussion under basic compounding in which the fundamentals of compounding are covered, the manual is divided into nine sections dealing with specific subjects. The first section covers processing, with details of the proper batch weights, extrusion and calendering techniques and building operations. The second section, on softeners, contains a table of a softener study of 35 of these materials. Fillers are covered in section three, with some of the results presented graphically. A study of 12 different fillers, including various grades of carbon black was made. The fourth section gives results of a study of accelerator types and combinations; while mixtures with rubber and other polymers are treated in section five. The important subject of resistance to solvents and oils is presented in section six, and other sections cover resistance to high and low temperatures and miscellaneous properties. The final section on product compounding, gives recipes and physical properties of the vulcanizates of stocks for sponge, hose, fuel resistance, friction and calendering, stocks of different degrees of hardness, and stocks containing rubber and reclaimed rubber.

"Witco Carbon Blacks in Natural Rubber, GR-S (Buna S), Reclaim, and GR-M (Neoprene GN)." Wishnick-Tumpeer, Inc., Witco Research Laboratories, 6200 W. 51st St., Chicago, Ill. Report 43-2. May, 1943. 16 pages. The physical properties and the behavior in natural, two different synthetic, and reclaimed rubbers with four grades of Witco channel black are summarized in this report. Two new Witco channel blacks, #12 and #14, of a larger particle size have been developed to fill the need of easier processing and lower heat generation in GR-S and are compared with the standard and very fine particle-size blacks in this rubber. The important physical test results are presented graphically as well as in tabular form for all of the studies.

"Suprex Clay in Buna S." Bulletin No. 1. J. M. Huber, Inc., 460 W. 34th St., New York, N. Y. 13 pages. An investigation undertaken with the main object of determining if it would be possible to extend the limited supply of semi-reenforcing furnace black by the use of combinations of easy-processing channel black and hard clay has indicated not only the practicability of such a replacement, but has also pointed the way toward future compounding of clay in Buna S. After the proper ratio of easy-processing channel black (Wyex) and hard clay (Suprex) was found, the effects of 20, 40, and 60% replacement of the S. R. black (Gastex) in loadings of 50, 75, 100, 125, and 150 parts were studied and summarized. The results are given in detail in tabular form and are also presented as graphs for some of the properties. Tensile, modulus, and elongation show the least effect on replacement; while permanent set and hardness show appreciable change above 20% replacement. Resilience, tear resistance, and processing are affected even at low loadings and with low replacement, but both moduli and resilience may be improved by increasing the sulphur content of the stocks. It is pointed out that it is difficult to match all properties of S. R. black by this replacement, but that it is not always essential to match all properties for many applications.

"Chat Number 30—Furnex." Binney & Smith Co., 41 E. 42nd Street, New York, N. Y. 10 pages. The advantages of the use of the semi-reenforcing furnace type of carbon black, Furnex, in natural and synthetic rubbers are described in this bulletin. Photomicrographs and frequency distribution graphs of particle diameters illustrate the particle size difference between Furnex and Micronex channel black; while other graphs show the value of Furnex in producing less hardness and lower plasticity in rubber compounds as compared with channel carbon blacks, where these factors are of special importance. Rebound resilience and heat build-up in rubber compounds containing these two types of blacks are also compared. In a discussion of the compounding characteristics of Furnex, the value of this black in neoprene compounds is emphasized. Better rebound resilience with Furnex in the acrylonitrile-type polymers is also stressed. The over-all advantages of Furnex carbon black are summarized in concluding the bulletin.

"The Interaction between Rubber and Liquids. III. The Swelling of Vulcanized Rubber in Various Liquids." G. Gee. The British Rubber Producers' Research Association, 19 Fenchurch St., London, E. C. 3, England. Publication No. 28. 8 pages. The entropy of swelling of vulcanized rubber is estimated and assumed independent of the nature of the swelling liquid. The heat of swelling is related to the cohesive energy of the liquid, and a value of 66 cal./c.c. deduced for the cohesive energy density of rubber. The swelling power of a liquid can be approximately calculated if its cohesive energy and molecular volume are known, and substantial agreement with theory is found in most cases, although it is necessary to consider aliphatic and aromatic liquids separately.

"Prevention of Butadiene-Air Explosions by Addition of Nitrogen and Carbon-Dioxide." G. W. Jones and R. E. Kennedy. United States Department of the Interior, Bureau of Mines, Washington, D. C. R. I. 3691, March 1943. 16 pages. This report gives the results of numerous experiments to establish the limits of inflammability of butadiene-air mixtures to which various portions of nitrogen and carbon dioxide were added. Graphs and tables are provided for calculating the limits of inflammability of complex gases containing butadiene and for determining the percentages of oxygen that must not be exceeded to prevent mixtures containing butadiene from becoming inflammable.

"Apprentice Training Program." The B. F. Goodrich Co., Akron, O. 26 pages. This manual explains the purpose and methods of the Goodrich company's apprentice training program which has been in operation for more than twenty years. Details of administration of the program, length of apprenticeship, shopwork schedules, classroom curriculum, wages, vacations, recreation, etc. are given in order that a comparison may be made with programs of this sort that other companies may have or may be contemplating.

"Higher Tensile 'Thiokol' FA Compounds." Technical Service Bulletin #8. Thiokol Corp., Trenton, N. J. 2 pages. This balletin indicates a practical factory compound in which softer grades of channel black blended with semi-reenforcing black produces "Thiokol" FA stocks with higher tensiles than those in which semi-reenforcing blacks alone are used.

"Crude Rubber." The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York, N. Y. 54 pages. This digest of background information about crude rubber, compiled from authoritative sources, is intended primarily to assist writers and editors in preparing articles on this subject. It represents an excellent ready reference source for other interested persons on such subjects as a chronology of rubber up to the discovery of vulcanization in 1839, the Amazon Valley as an early source of rubber, and a wealth of material on plantation rubber, including history, technology, and definition of grades. Much information on prices, stocks, production, and consumption is included. The bulletin concludes with a section entitled, "The War Emergency," in which the activities of private and government organizations to provide a supply of rubber during the war are summarized. Some data on the various kinds of wild rubber and the chemical and physical properties of rubber are also presented.

"Chemical Industry Survey." 1943 Edition. Merrill Lynch, Pierce, Fenner & Beane, 70 Pine St., New York, N. Y. 56 pages. An interesting survey of the major industrial revolution by which the chemical industry is about to become the nation's number one basic industry is given in this bulletin. The subjects covered are both general and specific, i.e., management, labor costs and relations, research, foods, plastics, rayon, synthetic rubber, and petroleum chemicals. A study of the basic position, capitalization, comparative financial position, etc., of thirty companies including American Cyanamid, American Viscose, Columbian Carbon, Commercial Solvents, du Pont, Durez Plastics, Industrial Rayon, Monsanto, Union Carbide & Carbon, United Carbon, and U. S. Industrial Alcohol, is both informative and valuable.

"Teamwork for Victory." Automotive Council for War Production, Detroit, Mich. 28 pages. **"Battery Service Manual."** The Association of American Battery Manufacturers, Akron, O. 39 pages. **"New List of American Standards."** American Standards Association, New York, N. Y. 19 pages. **"Manpower Reports."** Manpower Division, Automotive Council for War Production, Detroit, Mich. 11 pages. **"Spreading the Work . . . the Salvation of American Industry."** Smaller War Plants Corp., Washington, D. C. 22 pages. **"Employment Advertising Encyclopedia."** Parish & Phillips Newspaper Counselors, Miami, Fla. 36 pages. **"Report on Air Transport."** Office of War Information, Washington, D. C. 29 pages. **"Choosing Women for War-Industry Jobs."** United States Department of Labor, Washington, D. C. 10 pages.

RUBBER BIBLIOGRAPHY

PEACETIME MARKETS IN TIRES AND TUBES. S. E. Overley, *Domestic Commerce*, June, 1943, pp. 9, 11.

SYNTHETIC RUBBER. A Survey of Its Past, Present, and Future. H. L. Fisher, *Chem. Eng. News*, May 25, 1943, pp. 741-50.

MAINTENANCE OF STEAM GENERATING EQUIPMENT. Part 2. A. V. Lendemann, *Tire Rebuilders News*, pp. 22, 27.

EFFECT OF PETROLEUM PRODUCTS ON BUNA S VULCANIZATES. R. E. Morris, P. Mitton, J. C. Montermoso, and T. A. Werkenthin, *Ind. Eng. Chem.*, June, 1943, pp. 646-49.

KEM-POL—PROPERTIES, CHARACTERISTICS AND APPLICATIONS. W. T. Walton, *Rubber Age (N. Y.)*, June, 1943, pp. 234-39.

LINING FUEL STORAGE TANKS WITH SYNTHETIC RUBBER SHEET. J. W. Crosby, *Rubber Age (N. Y.)*, June, 1943, pp. 240-41.

PREVENTING THE BACTERIAL OXIDATION OF RUBBER. A. E. Dimond and J. G. Horsfall, *Rubber Age (N. Y.)*, June, 1943, pp. 242-43.

INDUSTRIAL HYGIENE PROBLEMS IN THE SYNTHETIC RUBBER INDUSTRY. F. A. Van Atta and A. M. Noyes, *Chem. Met. Eng.*, June, 1943, pp. 119-21.

e Corps Photo

SUN RUBBER PROCESSING OIL

improves flow . . . speeds molding of rubber for gas masks

With the lives of American boys at stake, the production of gas masks that *will not fail* assumes tremendous importance. These masks must go on easily, fit securely and function perfectly. The "rubber faces" of these masks must be tough and pliable to withstand hard usage and abuse . . . to resist sunlight, heat and cold, as well as chemical gases. *Circo Light Process Oil* is helping many manufacturers of these vital products to secure the necessary physical properties to meet exacting government specifications.

Circo Light Process Oil is highly compatible with most rubber compounds, speeds plasticization and makes processing easier. Only a small percentage of *Circo Light Process Oil* is required. Because it improves the flowing characteristics of the compound, molding is accomplished with greater ease and speed. All of these qualities help very substantially to improve the finished product . . . save labor . . . reduce costs.

In plasticizing pure rubber, reclaimed rubber or synthetic rubber, *Circo Light Process Oil* has proved to be the answer to many compounding and processing problems on a wide variety of war products. If you are encountering any difficulties with your present processing we suggest that you permit a SUN "Doctor of Industry" to demonstrate how Sun Processing Oils can help you to overcome them. . . . He is ready, willing and able to assist you . . . on short notice. Write to

SUN OIL COMPANY, *Philadelphia*

Sun Oil Company, Limited, Toronto, Canada

SUNOCO

SUN INDUSTRIAL PRODUCTS

HELPING INDUSTRY HELP AMERICA

Market Reviews

COMPOUNDING INGREDIENTS

THE June chemical trend followed along the same line as that of the previous month. Except for an ever-increasing conversion of usage to war production, no outstanding variations occurred.

BENZOL. Needs of benzol for synthetic rubber and aviation gasoline hold the benzol market in a tight grip. The situation is expected to become even more acute. Estimates of by-product coke oven operations in the week ended June 12 indicate production of 3,697,000 gallons from that source. All material is under WPB allocation control. The price is steady.

BUTADIENE. Sufficient supplies are on hand to take care of all available synthetic styrene.

CARBON BLACKS. Demand for semi-reenforcing furnace blacks continues to exceed the supply. Other producers of furnace blacks are now in production, however, and as soon as their materials are approved by the rubber companies, there should be an improvement in the supply position. The latter situation will depend largely, of course, upon how rapidly synthetic rubber plants come into production.

Increased production of furnace-type carbon black, used in rubber compounding, will meet both domestic and export requirements it was revealed at a recent meeting of the WPB Carbon Black Manufacturers Industry Advisory Committee. The excellent cooperation of the industry during the past twelve months and the initial production of several new plants have resulted in greatly increased production of the furnace-type carbon black. The channel type is well in hand, and it will not be necessary to curtail shipments to the printing ink, paint, and other consumers of this type of black.

Creation of a carbon-black hopper car pool was considered imperative by the Advisory Committee in order that maximum efficiency can be maintained with fewer cars of this type. As carbon black is shipped in bulk as well as in paper bags, the use of special light-weight covered hopper cars is required. A car pool, it was pointed out, would enable the industry to lease part of its fleet of cars to other essential industries whose products are not too heavy for this type of transportation.

I. Drogin, director of research, United Carbon Co., Charleston, W. Va., writing in the New York *Journal of Commerce* on June 3, pointed out that because of the importance of carbon blacks in the compounding of GR-S, expansion of plants for the production of special carbon blacks as indicated in Progress Report No. 3 of the Rubber Director was now under way. The demand for reenforcing-type furnace blacks has become so great that manufacturing facilities for more than 300,000,000 pounds a year will soon be available. Carbon blacks of all types required for the balance of this year are estimated as being in excess of 400,000,000 pounds. If the production of synthetic rubber and imports of crude rubber reach the figure contemplated for 1944, requirements for carbon black for 1944 will be at least 800,000,000 pounds, considerably in excess of the carbon black consumption for 1939 when the record consumption of 500,000,000 pounds was realized.

CASEIN. Producers' ceiling prices for industrial casein were raised 3¢ a pound by the OPA on June 16 to encourage the sale of skim milk off farms for use in producing the casein. Ceiling prices for wet and dry curd casein now range from 18 to 22½¢ a pound. The ceilings for industrial processed casein of different types range from 24 to 25½¢ per pound. Prices are f.o.b. the place from which the seller ships to the buyer. Provision is made for quantity discounts and for the addition of the lowest freight charges when the price quoted is a delivered one. Other differentials are allowed for special services. For example, an addition of ½¢ a pound is permitted when the seller grinds the casein at the buyer's request and to his specifications and requirements. These and other changes are made in Amendment No. 16 to MPR No. 289, effective June 20.

RUBBER SUBSTITUTES. Demand has greatly increased.

SYNTHETIC RESINS. With the use of raw materials still greatly restricted by WPB orders, the output of the phenol-formaldehyde, urea, and phthalic alkyd resins available for other than war production uses continues greatly limited. Producers and suppliers could sell twice the quantities of these resins that they are now marketing, if permitted to do so. Although WPB's allocations for civilian use for the current month show more liberality than for some time, the bulk of the business in these resins is still being furnished by war orders.

ZINC OXIDE. Buying of American process oxides is holding out well, and, although business in French process oxides is necessarily restricted by the need of procuring authorization to purchase zinc slabs, there is also a fair volume of business in these materials.

Current Quotations*

Abrasives

Pumicestone, powdered	lb.	$0.035 /$0.04
Rottenstone, domestic	lb.	.025

Accelerators, Inorganic

Lime, hydrated, *l.c.l.*, New York	ton	25.00
Litharge (commercial)	lb.	.09
Magnesia, calcined, heavy	lb.	
technical, light	lb.	.0625/ .07

*Prices in general are f.o.b. works. Range indicates grade or quantity variations. Space limitation prevents listing of all known ingredients. Prices are not guaranteed, and those readers interested should contact suppliers for spot prices.

Accelerators, Organic

A-1	lb.	$0.28 /$0.33
A-10	lb.	.36 / .42
A-19	lb.	.52 / .65
A-32	lb.	.60 / .70
A-46	lb.	.50 / .57
A-77	lb.	.42 / .55
A-100	lb.	.42 / .55
Accelerator 49	lb.	.41 / .42
808	lb.	.59 / .61
833	lb.	1.13 / 1.15
Acrin	lb.	.65
Advan	lb.	.55
Aldehyde ammonia	lb.	.65 / .70
Altax	lb.	.43 / .45
Arazate	lb.	1.53
B-J-F	lb.	.38 / .43
Beutene	lb.	.59 / .64
Butasan	lb.	1.13
Butazate	lb.	1.13
Butyl Eight	lb.	.97 / .99
C-P-B	lb.	1.95
Captax	lb.	.38 / .40
D-B-A	lb.	1.95 /
Delac A	lb.	.39 / .48
O	lb.	.39 / .48
P	lb.	.39 / .48
Di-Esterex-N	lb.	.50 .57
DOTG (Diorthotolyguanidine)	lb.	.44 / .46
DPG (Diphenylguanidine)	lb.	.35 / .36
El-Sixty	lb.	.40 / .47
Erie Accelerator	lb.	.60 .62
Ethasan	lb.	1.13
Ethazate	lb.	1.13
Ethylideneaniline	lb.	.42 / .43
Formaldehyde P.A.C.	lb.	.06 / .0625
Formaldehyde-para-toluidine	lb.	.63 / .65
Formaniline	lb.	.36 / .37
Guantal	lb.	.39 / .48
Hepteen	lb.	.34 / .39
Base	lb.	1.25 / 1.40
Hexamethylenetetramine U.S.P.	lb.	.39
Technical	lb.	.33
Lead oleate, No. 999	lb.	.135
Witco	lb.	.15
Ledate	lb.	1.48
M-B-T	lb.	.38 / .40
M-B-T-S	lb.	.43 / .45
Methasan	lb.	1.23
Methazate	lb.	1.23
Monex	lb.	1.53
Morfex "33"	lb.	.67 / .72
"55"	lb.	.96 / 1.01
O-X-A-F	lb.	.38 / .43
Oxynone	lb.	.77 / .90
Para-nitroso-dimethylaniline	lb.	.85
Pentex	lb.	.74 / .84
Flour	lb.	.1225/ .1325
O	lb.	
Flour	lb.	
Phenex	lb.	.49 / .54
Pipazate	lb.	1.53
Pip-Pip	lb.	1.63
R & H 50-D	lb.	.42 / .43
Rotax	lb.	.48 / .50
Safex	lb.	1.15 / 1.25
Santocure	lb.	.60 / .67
Selenac	lb.	1.98
SPDX	lb.	.69 / .74
A	lb.	.69 / .74
Super sulphur No. 2	lb.	.13 / .15
Tetrone A	lb.	2.20
Thiocarbanilide	lb.	.28 / .33
Thiofide	lb.	.43 / .50
Thionex	lb.	1.53
Thiotax	lb.	.38 / .45
Thiurad	lb.	1.53
Thiuram E	lb.	1.53
M	lb.	1.53
Trimene	lb.	.54 / .64
Base	lb.	1.03 / 1.18
Triphenylguanidine (TPG)	lb.	.45
Tuads, Methyl	lb.	1.53
Tuex	ton	1.53
2-MT	lb.	0.58 / 0.60
Ulto	lb.	.99 / 1.04
Ureka	lb.	.50 / .57
Blend B	lb.	.50 / .57
C	lb.	.48 / .55
Vulcanex	lb.	.42 / .43
Z-B-X	lb.	2.45
Zenite	lb.	.40 / .42
A	lb.	.45 / .47
B	lb.	.42 / .44
Zimate, Butyl	lb	1.13
Ethyl	lb.	1.13
Methyl	lb.	1.23
Zipacel	lb.	1.65

Activators

Aero Ac 50	lb.	.46 / .52
Barak	lb.	.50
MODX	lb.	.295 / .345
SL-20	lb.	.1089/ .1135

Age Resisters

AgeRite Alba	lb.	1.95 / 2.05
Gel	lb.	.52 / .54
Hipar	lb.	.61 / .63
Powder	lb.	.43 / .45
Resin	lb.	.43 / .45
D	lb.	.43 / .45
White	lb.	1.23 / 1.33
Akroflex C	lb.	.53 / .65
Albasan	lb.	.69 / .74
Aminox	lb.	.43 / .52
Antox	lb.	.54 / .56
Betanox	lb.	.43 / .52

B-L-E	lb.	$0.43	/$0.52
Powder	lb.	.61	/ .70
B-X-A	lb.	.43	/ .52
Copper Inhibitor X-872-A	lb.	1.15	
Flectol H	lb.	.43	/ .55
White	lb.	.89	/ 1.00
M-U-F	lb.	1.48	
Neozone (standard)	lb.	.61	/ .63
A	lb.	.43	/ .45
C	lb.	.43	/ .55
D	lb.	.43	/ .45
Distilled	lb.	.48	/ .50
E	lb.	.61	/ .63
Oxynone	lb.	.77	/ .90
Permalux	lb.	1.18	/ 1.20
Santoflex B	lb.	.43	/ .55
BX	lb.	.54	/ .64
Santovar A	lb.	1.15	/ 1.40
Stabilite	lb.	.48	/ .69
Alba	lb.	.50	/ .74
Thermoflex A	lb.	.61	/ .63
C	lb.	.54	/ .56
Tysonite	lb.	.165	/ .1675
V-G-B	lb.	.43	/ .52

Alkalies

Caustic soda, flake, Columbia (400-*lb. drums*)	100 *lbs.*	2.70	/ 3.55
Liquid, 50%	100 *lbs.*	1.95	
Solid (700-*lb. drums*)	100 *lbs.*	2.30	/ 3.15

Antiscorch Materials

Antiscorch T	lb.	.90	
Cumar RH	lb.	.105	
E-S-E-N	lb.	.34	/ .39
R-17 Resin (*drums*)	lb.	.1075	
RM	lb.	1.25	
Retarder W	lb.	.36	
Retardex	lb.	.445	/ .475
U-T-B	lb.	.34	/ .39

Antiseptics

Compound G-4	lb.	1.50	
G-11	lb.	4.50	

Antisun Materials

Heliozone	lb.	.23	/ .24
S.C.R.	lb.	.32	/ .34
Sunproof	lb.	.2275	/ .2775
Jr.	lb.	.165	/ .215

Blowing Agents

Ammonium Carbonate, lumps (500-*lb. drums*)	lb.	.0825	
Unicel	lb.	.50	

Brake Lining Saturant

B.R.T. No. 3	lb.	.0175	/ .0185

Colors

Black

Du Pont powder	lb.	.42	
Lampblack (commercial), *l.c.l.*	lb.	.15	

Blue

Du Pont Dispersed	lb.	.35	/ .95
Powders	lb.	2.25	/ 3.75
Heliogen BKA	lb.		
Toners	lb.		

Brown

Mapico	lb.	.1135	

Green

Chrome	lb.	.25	
Oxide (*freight allowed*)	lb.	.24	
Du Pont Dispersed	lb.	.98	/ 2.85
Powders	lb.	1.00	
Guignet's (*bbls.*)	lb.	.70	
Toners	lb.		

Orange

Du Pont Dispersed	lb.	.88	/ 2.35
Powders	lb.	2.75	/ 3.05
Toners	lb.		

Orchid

Toners	lb.		

Pink

Toners	lb.		

Purple

Toners	lb.		

Red

Antimony			
Crimson, 15/17%	lb.		
R.M.P. No. 3	lb.	.48	
Sulphur free	lb.		
R.M.P.	lb.	.52	
Golden 15/17%	lb.		
7-A	lb.	.37	
Z-2	lb.	.25	
Cadmium, light (400-*lb. bbls.*)	lb.	.85	/
Du Pont Dispersed	lb.	.93	/ 2.05
Powders	lb.	.60	/ 1.65
Iron Oxide, *l.c.l.*	lb.	.08	/ .16
Mapico	lb.	.096	
Rub-Er-Red (*bbls.*)	lb.	.0975	
Toners	lb.		

White

Lithopone (*bags*)	lb.	.0425	/ .045
Albalith	lb.	.0425	/ .045
Astrolith (50-*lb. bags*)	lb.	.0425	/
Azolith	lb.	.0425	/ .045
Titanium Pigments			
Ray-Bar	lb.	.0575	/ .0625
Ray-Cal	lb.	.055	/ .06
Rayox	lb.	.145	/ .155
Titanolith (50-*lb. bags*)	lb.	.056	/ .0575
Titanox-A	lb.	$0.145	/$0.15
B	lb.	.0575	/ .06
30	lb.	.0575	/ .06
C	lb.	.055	/ .0575
RC	lb.	.055	/ .0575
RC-HT	lb.	.055	/ .0575
Ti-Tone	lb.		
Zopaque (50-*lb. bags*)	lb.	.145	/ .1525
Zinc Oxide			
Azo ZZZ-11	lb.	.0725	/ .075
44	lb.	.0725	/ .075
55	lb.	.0725	/ .075
66	lb.	.095	/ .0975
French Process, Florence			
Green Seal-8	lb.	.09	/ .0925
Red Seal-9	lb.	.085	/ .0875
White Seal-7	lb.	.095	/ .0975
Kadox, Black Label-15	lb.	.0725	/ .075
No. 25	lb.	.085	/ .0875
72	lb.	.0725	/ .075
Red Label-17	lb.	.0725	/ .075
Horse Head Special 3	lb.	.0725	/ .075
XX Red-4	lb.	.0725	/ .075
23	lb.	.0725	/ .075
72	lb.	.0725	/ .075
78	lb.	.0725	/ .075
80	lb.	.0725	/ .075
103	lb.	.0725	/ .075
110	lb.	.0725	/ .075
St. Joe (lead free)			
Black Label	lb.	.0725	/ .075
Green Label	lb.	.0725	/ .075
Red Label	lb.	.0725	/ .075
U.S.P.	lb.	.105	/ .1075
Zinc Sulphide Pigments			
Cryptone-BA-19	lb.	.056	/ .0585
BT	lb.	.056	/ .0585
CB	lb.	.056	/ .0585
MS	lb.	.0575	/ .06
ZS No. 20	lb.	.0825	/ .085
86	lb.	.0825	/ .085
230	lb.	.0825	/ .085
800	lb.	.0825	/ .085
Sunolith	lb.	.0425	/

Yellow

Cadmolith (cadmium yellow), (400-*lb. bbls.*)	lb.	.60	
Du Pont Dispersed	lb.	1.25	/ 1.85
Powders	lb.	.70	/ 1.75
Mapico	lb.	.071	
Toners	lb.		

Dispersing Agents

Bardex	lb.	.0425	/ .045
Bardol	lb.	.025	/ .0275
B	lb.	.05	/ .0525
Darvan No. 1	lb.	.30	/ .34
2	lb.	.30	/ .34
3	lb.	.30	/ .34
Nevoll (*drums, c.l.*)	lb.	.02	/ .025
Santomerse S	lb.	.11	/ .25

Extenders

Advagum 1098	lb.	.42	
1198	lb.	.40	
Extendex C	lb.		
Naftolen	lb.	.15	/ .20
"600"	lb.	.14	/ .16
Vanzak	gal.	.05	/ .06

Fillers, Inert

Asbestine, *c.l.*	ton	20.00	
Asbestos Fiber	ton	15.50	/ 48.00
Barytes	ton	40.00	
f.o.b., St. Louis (50-*lb. paper bags*)	ton	25.55	
Off color, domestic	ton	29.00	
White, domestic	ton	38.50	
Blanc fixe, dry, precip	ton	80.00	
Calcene	ton	37.50	/ 43.00
Infusorialearth	lb.	.0225	
Kalite No. 1	ton	26.00	
3	ton	36.00	
Kalvan	ton	100.00	
Magnesium Carbonate *l.c.l.*	lb.	.0625	/ .1075
Paradene No. 2 (*drums*)	lb.	.0525	
Pyrax A	ton	7.50	
Whiting			
Columbia Filler	ton	9.00	/ 14.00
Suprex White	ton	32.50	
Witco, *c.l.*	ton	8.00	
Witcarb	lb.		

Finishes

Black-Out (surface protective)	gal.	4.50	/ 5.00
Mica, *l.c.l.*	ton	20.00	/40.00
Rubber lacquer, clear	gal.	1.00	/ 2.00
Colored	gal.	2.00	/ 3.50
Shoe varnish	gal.	1.45	
Talc	ton	25.00	

Flock

Cotton flock, dark	lb.	.10	/ .12
Dyed	lb.	.50	/ .80
White	lb.	.15	/ .20
Rayon flock, colored	lb.	1.00	/ 1.50
White	lb.	.90	/ 1.00

Latex Compounding Ingredients

Accelerator 552	lb.	1.63	
Aerosol OT Aqueous 25%	lb.		
Antox, dispersed	lb.	.54	
Aquarex D	lb.	.75	
F	lb.	.85	
MDL Paste	lb.	.25	
Areskap No. 50	lb.	.18	/ .24
100, dry	lb.	.39	/ .51
Aresket No. 240	lb.	.16	/ .22
300, dry	lb.	.42	/ .50
Aresklene No. 375	lb.	$0.35	/$0.50
400 dry	lb.	.51	/ .65
Black No. 25, dispersed	lb.	.22	/ .40
Casein, muriatic 30-mesh	lb.	.24	/ .2475
Collocarb	lb.	.07	
Color Pastes, dispersed	lb.	.75	/ 1.10
Copper Inhibitor X-872	lb.	2.25	
Dispersex No. 15	lb.	.11	/ .12
No. 20	lb.	.08	/ .10
Factex Dispersion A	lb.	.185	
Heliozone, dispersed	lb.	.25	
MICRONEX, Colloidal	lb.	.06	
R-2 Crystals	lb.	1.55	
S-1 (400-*lb. drums*)	lb.	.65	
Santobrite Briquettes	lb.		
Powder	lb.		
Santomerse D	lb.	.41	/ .65
S	lb.	.11	/ .25
Sodium Stearate	lb.	.40	
Stablex A	lb.	.90	/ 1.10
B	lb.	.70	/ .95
C	lb.	.40	/ .50
Sulphur, dispersed	lb.	.10	/ .15
No. 2	lb.	.08	/ .12
T-1 (440-*lb. drums*)	lb.	.40	
Tepidone	lb.	.63	
Tetrone A	lb.	2.20	
Tysonite, dispersed	lb.	.32	/ .35
Zenite Special	lb.	.47	
Zinc oxide, dispersed	lb.	.12	/ .15

Mineral Rubber

Black Diamond, *l.c.l.*	ton	25.00	/30.00
B.R.C. No. 20	lb.	.0105	/ .0115
Hydrocarbon, Hard	lb.	25.00	/27.00
MilliMar	lb.	.055	
Parmr	ton	22.00	
Pioneer, *c.l.*	lb.	25.00	/30.00
285°-300°	ton	25.00	/27.00

Mold Lubricants

Aluminum Stearate	lb.	.23	/ .24
Aquarex D	lb.	.75	
MDL Paste	lb.	.25	
Colite	gal.	.90	/ 1.15
Dipez Mold Wash	lb.		
Lubrex	lb.	.25	/ .30
Mold Paste	lb.	.12	/ .30
Rubber-Glo, conc. regular	gal.	.94	/ 1.15
Type W	gal.	.99	/ 1.20
Sericite	ton	65.00	
Soapstone, *l.c.l.*	ton	25.00	/35.00
Zinc Stearate	lb.	.30	/ .31

Oil Resistant

A-X-F	lb.	.82	/ .85

Reclaiming Oils

B.R.V.	lb.	.035	/ .0375
C-10	gal.	.19	/ .24
D-4	gal.	.17	/ .22
E-5	gal.	.15	/ .20
No. 1621	lb.	.021	/ .0235
S.R.O.	lb.	.02	/ .0225
X-60 (reclaiming)	gal.	.20	/ .27
X-443	gal.	.29	

Reenforcers

Alumina, Hydrated			
Alorco C-740	lb.	.0375	/ .065
C-741	lb.	.0375	/ .065
Buca	ton	40.00	
Carbon Black			
Aerfloted Arrow Specification (*bags only*)	lb.	.0355†	
Arrow Compact Granulized	lb.	.0355†	
Certified Heavy Compressed (*bags only*)	lb.	.0355†	
SPHERON	lb.	.0355†	/ .07
Channel "S"	lb.	.12	
Continental, dustless	lb.	.0355†	
"AA"	lb.		
Compressed (*bags only*)	lb.	.0355†	
Disperso	lb.	.0355†	
Dixie	lb.	.0355†	
Dixiedensed	lb.	.0355†	
66	lb.	.0355†	
Furnex	lb.	.035	
Beads	lb.	.035	
Gastex	lb.	.035	/ .06
HX	lb.	.0355†	
Kosmobile	lb.	.0355†	
66	lb.	.0355†	
77	lb.	.0355†	
S	lb.	.0355†	
Kosmos	lb.	.0355†	
Dixie 20	lb.	.035†	
MICRONEX Beads	lb.	.0355†	
Hi-Tear	lb.	.0355	
Mark II	lb.	.0355	
Standard	lb.	.0355	
W-5	lb.	.0355	
W-6	lb.	.0355	
P-33	lb.	.0475	
Pelletex	lb.	.035	/ .06
SPHERON C (*bags*)	lb.	.0455†	
I (*bags*)	lb.	.0405	
N (*bags*)	lb.	.15	
T (*bags*)	lb.	.09	
Statex	lb.		
STERLING	lb.	.035	
Thermax	lb.	.0225	
"S"	lb.	.0675	
TX	lb.	.0355†	
Velvetex	lb.		
"WYEX BLACK"	lb.	.0355†	

†Price quoted is f.o.b. works (bags). The price f.o.b. works (bulk) is $0.033 per pound. All prices are carlot.

Carbonex Flakes	lb.	$0.03	/$0.035
S	lb.	.031	/ .036
Plastic	lb.	.031	/ .0335
Clays			
Aerfloted Hi-White	ton	10.00	
LGB	ton	15.00	
Paragon (50-*lb. bags*)	ton	10.00	
Suprex (50-*lb. bags*)	ton	10.00	/23.50
Catalpo, *c.l.*	ton	30.00	
China	ton	25.00	
Dixie	ton	10.00	/22.50
"L"	ton	10.00	
Langford	ton	8.50	
McNamee	ton	10.00	
Par	ton	10.00	
Paraforce, *c.l.*	ton	50.00	
#33	ton	30.00	
Witco, *c.l.*	ton	10.00	
Cumar EX	lb.	.05	
MH	lb.	.065	/ .115
V	lb.	.095	/ .125
465 Resin	lb.		
"G" Resin	lb.		
Nevindene	lb.		
Silene	lb.	.04	/ .045
"EF"	ton	120.00	/110.00

Reodorants

Amora A	lb.		
B	lb.		
C	lb.		
D	lb.		
Para-Dors	lb.	.65	/ 5.00
Rodo No. 0	lb.	4.00	/ 4.50
10	lb.	5.00	/ 5.50

Rubber Substitutes

Black	lb.	.095	/ .17
Brown	lb.	.095	/ .18
White	lb.	.10	/ .20
Factice			
Amberex Type B	lb.	.20	
Brown	lb.	.095	/ .19
Neophax A	lb.	.165	
B	lb.	.165	
White	lb.	.10	/ .20
Polyester, Millable 56-40A	lb.	.36	/ .38
Vulprene 72-28AR	lb.	.40	/ .45
Dispersion B7-41	lb.	.25	/ .26

Softeners and Plasticizers

Ambidex Regular	lb.	.25	
S	lb.		
B.R.T. No. 7	lb.	.02	/ .021
Bondogen	lb.	.98	/ 1.05
Bunnatol (for synthetic rubber)	lb.		
G	lb.	.40	/ .50
S	lb.	.40	/ .50
Burgundy pitch	lb.		
Copene Resin	lb.	.32	
Dipolymer Oil	gal.	.33	/ .38
Dispersing Oil No. 10	lb.	.0375	/ .04
Falkomer 106	lb.	.30	
108	lb.	.30	
LM-Nypene (*drums*)	lb.	.25	
LX-436 (*tank car*)	lb.	.027	
Myristilene	lb.	.20	/ .30
Nevinol	lb.	.13	/ .14
Nuba resinous pitch (*drums*)			
Grades No. 1 and No. 2	lb.	.29	
3-X	lb.	.0425	
Nypene Resin	lb.	.32	
Palm oil (Witco), *c.l.*	lb.		
Palmalene	lb.	.15	/
Palmol	lb.	.16	25
Para Flux (reg.)	gal.	.17	/ .18
No. 2016	gal.	.135	/ .19
Para Lube	lb.	.046	/ .048
Paradene No. 1 (*drums*)	lb.	.0525	
Special (*drums*)			
20 to 35° C. M.P.	lb.	.0625	
35 to 45° C. M.P.	lb.	.0625	
45 to 75° C. M.P.	lb.	.0575	
Peptizene	lb.	.65	
Piccocizer "30"	lb.		
Piccolyte Resins	lb.	.15	/ .185
Piccoumaron Resins	lb.	.045	/ .15
Pictar	gal.	.18	/ .23
Pine tar	gal.		
Oil	gal.	.45	
Plasticizer B	lb.	.35	/ .45
Plastoflex No. 10	lb.	.20	
No. 20	lb.	.25	
Plastogen	lb.	.0775	/ .08
Plastone	lb.	.27	/ .30
R-19 Resin (*drums*)	lb.	.1075	
21 Resin (*drums*)	lo.	.1075	
Reogen	lb.	.115	/ .12
RPA No. 1E	lb.	.55	
2	lb.	.65	
3	lb.	.46	
4	lb.	.80	
"S-Oil"	gal.	.15	/ .20
Tackol	lb.	.085	/ .18
Tarzac	lb.	.23	/ .24
Tonox	lb.	.50	/ .59
Turgum	100 lbs.	7.35†	
Vistac No. 1	lb.	.20	/ .214
No. 2	lb.	.214	/ .227
Witco No. 20, *l.c.l.*	gal.	.20	
X-1 resinous oil (*tank car*)	lb.	.011	/ .016
XX-100 Resin	lb.	.0525	

Softeners for Hard Rubber Compounding

Resin C Pitch 45°C. M.P.	lb.	.015	/ .016
60°C. M.P.	lb.	.015	/ .016
75°C. M.P.	lb.	.015	/ .016

Solvents

Beta-Trichlorethane	lb.	.20	
Carbon Bisulphide	100 lbs.	5.75	
Tetrachloride	gal.	.80	
Cosol No. 1	gal.	$0.26	
No. 2	gal.	.25	
No. 3	gal.	.22	
Industrial 90% benzol (*tank car*)	gal.	.15	/$0.22
Nevsol	gal.	.245	/ .31
Picco	gal.	.22	/ .32
Skellysolve	gal.		

Stabilizers for Cure

Barium Stearate	lb.	.29	/ .32
Calcium Stearate	lb.	.26	/ .27
Laurex (*bags*)	lb.	.1475	/ .1725
Lead Stearate	lb.		
Magnesium Stearate	lb.	.31	/ .32
Stearex B	lb.	.15⅝	/ .16⅜
Beads	lb.	.14⅞	/ .15⅞
Stearic acid, single pressed	lb.	.15⅜	.16⅜
Stearite, *c.l.*	lb.	.1487	
Zinc Laurate	lb.	.29	/ .32
Stearate	lb.	.31	

Synthetic Rubber

Agripol Solids *l.c.*	lb.	.44	/ .52
Solutions *l.c.*	lb.	.27	/ .29
Hycar OR-15	lb.	.63	
OR-25	lb	.56	
OS-10	lb.	.56	
Neoprene Latex Type 571	lb.	.25	
60	lb.	.36	
Neoprene Type CG	lb.	.70	
E	lb.	.65	
FR	lb.	.75	
G	lb.	.70	
ILS	lb.	.70	
KNR	lb.	.75	
M	lb.	.65	
Perbunan 26	lb.	.63	
Synthetic 100	lb.	.41	
"Thiokol" Type "A"	lb.	.35	
"FA"	lb.	.50	
Molding powder No. 472	lb.	.61	
1001	lb.	.75	

Tackifiers

B.R.H. No. 2	lb.	.02	/ .021
LX-433 (*tank car*)	lb.	.068	
P.H.O. (*drums*)	lb.	.24	
Plastac	lb.	.12	

Vulcanizing Ingredients

Magnesia, light (for neoprene)	lb.	.25	/
Sulphur	100 lbs.	2.05	
Chloride (*drums*)	lb.	.04	
Telloy	lb.	1.75	
Thiogen 6	lb.	.18	/ .25
10	lb.	.18	/ .25
Vandex	lb.	1.75	
(See also Colors—Antimony)			

Waxes

1515-A (black)	gal.	1.35	
C (clear)	gal.	1.25	
Carnauba, No. 3 chalky	lb.	.7125	.7225
2 N.C.	lb.	.7575	.7675
3 N.C.	lb.		
1 Yellow	lb.	.8325	
2	lb.	.8125	
Carnube	lb.	.49	/ .59
Monten	lb.	.12	/ .17
Rubber Wax No. 118,			
Neutral	gal.	.76	/ 1.31
Colors	gal.	.86	/ 1.41

RECLAIMED RUBBER

THE cost of reclaiming scrap rubber would increase considerably if the long-delayed official application of Amendment No. 3 to Revised Price Schedule 87—Scrap Rubber[1]—went into effect on July 1 as planned. However it is understood that although there will be some increase in the prices of various grades of scrap rubber to the reclaimers, these increases will be much less than contemplated in Amendment 3. Assured of a good supply of most grades of scrap rubber and with the demand for the large-volume grades of reclaim for use in recapping likely to continue for some time, the outlook for reclaim manufacturers is good. As soon as the volume of natural rubber scrap begins to decline appreciably, it will be replaced by an increasing volume of synthetic rubber scrap, and according to the present view the reclaiming of the latter can be accomplished without major changes in production methods. Ceiling prices on selected grades of natural rubber reclaim are listed below:

[1] INDIA RUBBER WORLD, Dec., 1942, p. 318.

Ceiling Prices

Auto Tire	Sp. Grav.	¢ per Lb
Black Select	1.16-1.18	6½/ 6¾
Acid	1.18-1.22	7½/ 7¾
Shoe		
Standard	1.56-1.60	7 / 7¼
Tubes		
Black	1.14-1.26	11¼/11½
Gray	1.15-1.26	12½/13¼
Red	1.15-1.32	12 /12¼
Miscellaneous		
Mechanical blends	1.25-1.50	4½/ 5½
White	1.35-1.50	13½/14½

The above list includes those items or classes only that determine the price bases of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Rims Approved and Branded by The Tire & Rim Association

Rim Size	May, 1943
15" & 16" D. C. Passenger	
16x4.00E	8,052
16x4.25E	6,712
16x4.50E	8,341
16x5.00F	5,604
15x5.50F	2,424
16x5.50F	10,779
17" & Over Passenger	
18x2.15B	7,761
18x3.62F	1,617
18x4.00F	2,192
Military	
16x4.50CE	92,704
16x6.50CS	61,499
20x4.50CR	4,533
20x6.00CT	15,516
22x6.00CT	3,701
18x8.00CV	3,307
20x10.00CW	922
24x10.00CW	2,803
Flat Base Truck	
18x3.75P (5")	444
20x4.33R (6")	30,027
15x5.00S (7")	10,517
16x5.00S (7")	3,732
18x5.00S (7")	3,002
20x5.00S (7")	297,892
15x6.00T (8")	4,238
20x6.00T (8")	30,223
22x6.00T (8")	4,239
20x7.33V (9/10")	14,736
24x7.33V (9/10")	3,922
19x8.37V (11")	302
20x8.37V (11")	2,520
24x8.37V (11")	893
24x10.00W	509
Semi D. C. Truck	
16x4.50E	5,062
16x5.50F	1,004
Tractor & Implement	
12x3.00D	7,555
19x3.00D	1,817
24x8.00T	2,294
W8-24	7,605
W9-24	1,933
DW7-38	3,558
DW9-38	3,844
DW10-38	2,228
Cast	
24x15.00	113
TOTAL	682,676

TRADE MARKS

United States

401,352. **Nevtex.** Plasticized coumarone-indene polymer compositions adapted for the weatherproofing of textile fabrics. Neville Co., Neville Island, Pittsburgh, Pa.

401,386. Representation of a triangle with the words: **"Safety, Silence, Service, Triple Service."** Tires. McCreary Tire & Rubber Co., Borough of Indiana, Pa.

401,491. **Rubbercote.** Lacquer coating for wood, metal, fabric or rubber surfaces. Andrew Brown Co., Los Angeles, Calif.

COTTON & FABRICS

New York Cotton Exchange Week-End Closing Prices

	Apr. 24	May 22	June 1	June 5	June 12	June 19
July	19.96	20.00	20.18	20.16	20.25	20.24
Oct.	19.88	19.74	19.89	19.88	19.86	19.87
Dec.	19.83	19.59	19.74	19.72	19.68	19.67
Jan.	19.80	19.50	19.68	19.66	19.62	19.61
Mar.		19.37	19.51	19.51	19.48	19.44

New York Quotations

June 25, 1943

Drills

38-inch 2.00-yard	yd.		
40-inch 1.45-yard			
50-inch 1.52-yard			$0.29
52-inch 1.85-yard			.23 7/8
52-inch 1.90-yard		.23223	.2325
52-inch 2.20-yard			.20511
52-inch 2.50-yard			.185
59-inch 1.85-yard			.23851

Ducks

38-inch 2.00-yard D. F.	yd.	.215	.22 5/8
40-inch 1.45-yard S. F.			.2075
51 1/2-inch 1.35-yard D. F.			.335
72-inch 1.05-yard D. F.		.43	.45
72-inch 17-21 ounce			.48 7/8
Mechanicals			
Hose and belting	lb.		.4275
Tennis			
51 1/2-inch 1.35-yard	yd.		.315
51 1/2-inch 1.60-yard	yd.		.27 1/8
51 1/2-inch 1.90-yard	yd.		.23 1/8

Hollands—White

Blue Seal		
20-inch	yd.	.135
30-inch		.2425
40-inch		.27
Gold Seal		
20-inch	yd.	.145
30-inch		.2575
40-inch		.29
Red Seal		
20-inch	yd.	.1225
30-inch		.22
40-inch		.245

Osnaburgs

40-inch 2.34-yard	yd.	.155
40-inch 2.48-yard		.14 5/8
40-inch 2.56-yard S. F.		.14578
40-inch 3.00-yard		.1275
40-inch 7-ounce part waste		.15
40-inch 10-ounce part waste		.21 3/8
37-inch 2.42-yard clean		.1525

Raincoat Fabrics

Cotton		
Bombazine 64 x 60	yd.	
Plaids 60 x 48		
Surface prints 64 x 60		
Print cloth, 38 1/2-inch, 64 x 60		.08971
Sheeting, 40-inch		
48 x 48, 2.50-yard	yd.	.16200
64 x 68, 3.15-yard		.13968
56 x 60, 3.60-yard		.11944
44 x 40, 4.25-yard		.09764
Sheetings, 36-inch		
48 x 48, 5.00-yard	yd.	.08600
44 x 40, 6.15-yard		.06991

Tire Fabrics

Builder		
17 1/4 ounce 60" 23/11 ply Karded peeler	lb.	.565
Chafer		
14 ounce 60" 20/8 ply Karded peeler	lb.	.555
9 1/4 ounce 60" 10/2 ply Karded peeler	lb.	.555
Cord Fabrics		
23/5/3 Karded peeler, 1 1/16" cotton	lb.	.565
15/3/3 Karded peeler, 1 1/16" cotton	lb.	.545
12/4/2 Karded peeler, 1 1/16" cotton	lb.	.555
23/5/3 Karded peeler, 1 1/4" cotton	lb.	.565
Leno Breaker		
8 1/4 ounce and 10 1/4 ounce 60" Karded peeler	lb.	.565

THE June cotton market reflected a dull, inert tone, mainly because the trade is faced with a number of unpredictable situations, several of which might have directly opposite influences on the market. Under these conditions traders remain cautious, awaiting future developments. The chief uncertain features puzzling the industry are the possibilities of action in Washington on price control of agricultural commodities; the favorable reports from war fronts; the possibility of an early invasion of Europe; and peace overtures from one or more Axis nations. The crop news, not considered too seriously at the moment, will probably enter the picture as an important influence in the near future. In addition, the report that the Commodity Credit Corp. is ready to direct corn growers to liquidate all loans on the 1942 corn crop bred the fear that this might happen to cotton as well. The fear is well founded considering the fact that on June 5, according to the CCC, there were outstanding loans on 2,611,684 bales of the 1942 cotton crop. If these should be repossessed, it is felt that a major price recession will result.

Congress scored twice in its campaign against the Administration by overriding the Presidential veto of the anti-strike bill and then by rejecting the subsidy plan to roll back retail prices. These Congressional moves were construed as efforts to obtain higher-priced agricultural commodities, which in turn offers the probability of increased labor demands for higher wages.

New crop developments are coming in for more attention. The crop is doing well especially in the East and Central belts. Floods have subsided in the West, where much replanting has been done. Conditions are said to be about normal in the West and better than normal elsewhere. High summer temperatures compose the principal factor in weevil control, and according to a tabulation by the New York Cotton Exchange Service Bureau, the Eastern cotton belt and most of the Central belt have had much more weevil-killing weather this year than on an average in the past four years.

Persistent short-covering and price fixing in the spot delivery, attracting commission-house and spot-firm support to the five other active contracts on the New York Cotton Exchange, produced on June 24 the widest price movement in the futures market in more than a month, and lifted the July position to its highest level in fourteen years: 20.44¢ a pound.

Cotton consumption in the United States for the year ending this month is estimated at 11,300,000 bales, of which about 200,000 bales will consist of foreign growths. Inclusive of exports, the Bureau of Agricultural Economics estimates disappearance of American cotton this season at about 12,500,000 bales. This would compare with production last year of 12,824,000 bales, so that the carryover on August 1 should approximate 10,800,000 bales, or about 300,000 bales more than last year. In the light of these figures there is no threat of an over-all cotton shortage. True, the yield per acre of 272 pounds last year was the largest ever recorded, and the harvest may be materially smaller this year. Nevertheless with a carryover equal almost to a year's consumption, cotton is not a crop in which a shortage is threatened.

The price of 15/16-inch spot middling grade rose from 22.10¢ on June 1 to 22.15¢ on June 2, dropped to 21.17¢ on June 21, and closed at 21.88¢ on July 1.

Fabrics

All types of fabrics are widely wanted, but offerings are relatively meager. Civilian trade becomes increasingly repressed as war orders enlarge and progress. Raincoat manufacturers will buy all the material offered, but they are receiving very little as most concerns of that type are almost totally occupied with government orders. Most of government work is plain shade; consequently it absorbs practically the entire dyeing capacity.

Considerable demand for osnaburgs is noted, but little coming out. A noteworthy factor is the appearance of second-hand lots in light quantities here and there, for cash or on a swap basis, in quarters where the trade would have least expected to find such goods.

Converters report difficulty in making ends meet with inadequate gray cloth supplies. Cloths are being allotted to them irregularly, and when they do succeed in obtaining some yardage, delays and finishing obstacles frequently occur. Their offerings of finished goods reflect this tightness in the primary market.

Print cloth is all but impossible to buy without a high priority rating. Sheetings are greatly desired.

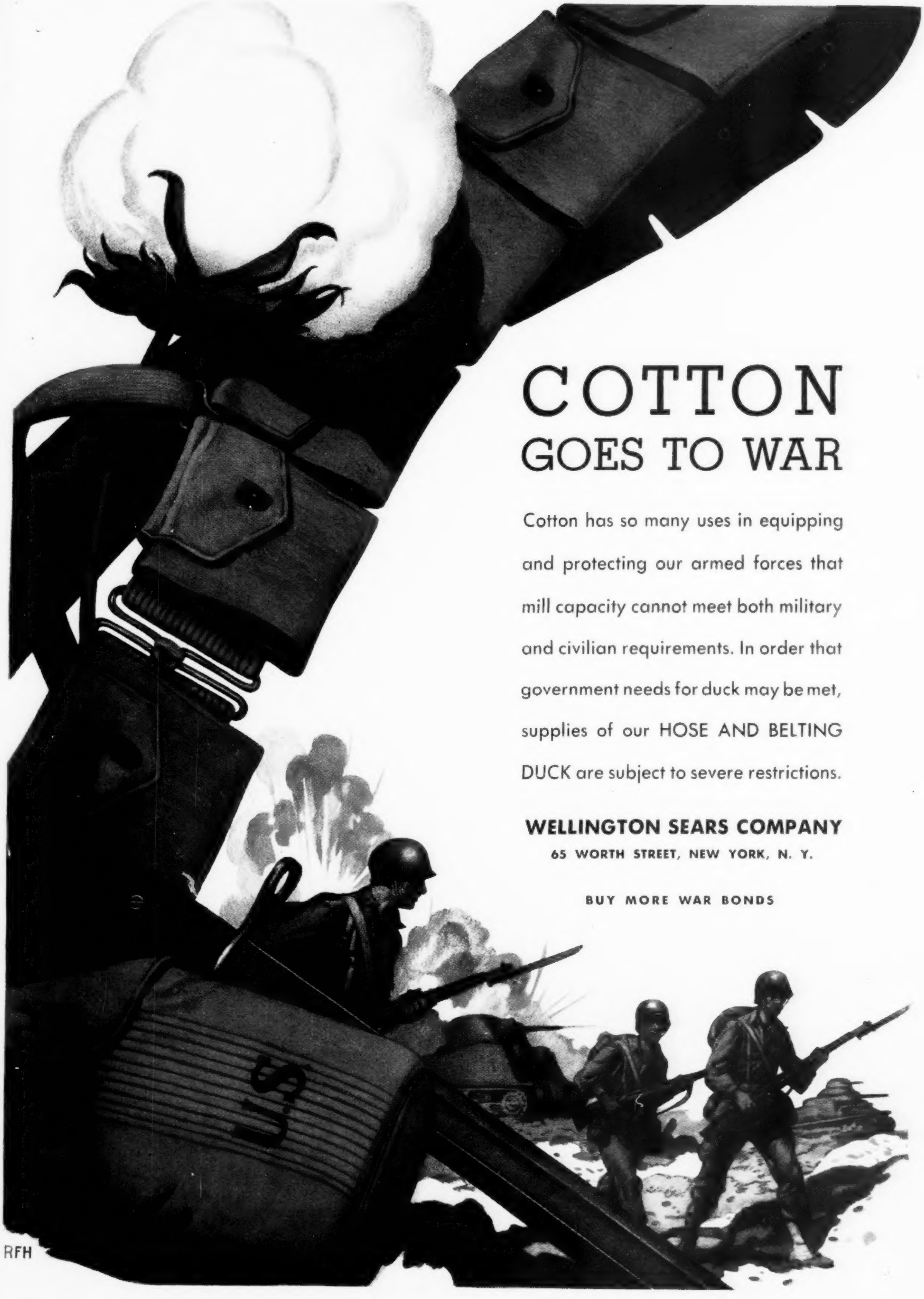
Demand for medium-weight ducks, wide drills, etc., has become exceptionally active because of war conditions. Loom production in the main has been taken up through the third quarter of 1943, with constant pressure from consuming interests for additional supplies.

Reports that production of high-tenacity rayon for the synthetic tire program will remove from the market large quantities of rayon for other uses were denied June 21 by Frank L. Walton, director of the Textile, Clothing & Leather Division, who said, "Studies made by the Textile Division show that present high-tenacity rayon plants can turn out about 68,000,000 pounds of high-tenacity rayon for tires in addition to the approximate 100,000,000 pounds already being produced."

Scrap Rubber Ceilings

Inner Tubes†	¢ per Lb.
No. 2 passenger tubes	7¾
Red passenger tubes	7½
Passenger tubes	6
Tires‡	$ per Short Ton
Mixed passenger tires	20.00
Beadless passenger tires	26.00
Solid tires	36.00
Peelings†	
No. 1 peelings	47.50
No. 2 peelings	47.50
No. 1 light colored (zinc) carcass	52.50
Miscellaneous Items‡‡	
Air brake hose	25.00
Miscellaneous hose	17.00
Rubber boots and shoes	33.00
Black mechanical scrap above 1.15 sp. gr.	20.00
General household and industrial scrap	15.00

† All consuming centers except Los Angeles.
‡ Akron only.
‡‡ All consuming centers.


COTTON
GOES TO WAR
Cotton has so many uses in equipping and protecting our armed forces that mill capacity cannot meet both military and civilian requirements. In order that government needs for duck may be met, supplies of our HOSE AND BELTING DUCK are subject to severe restrictions.
WELLINGTON SEARS COMPANY
65 WORTH STREET, NEW YORK, N. Y.
BUY MORE WAR BONDS
US
RFH

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.00 per line (ten words)	Light face type 40c per line (ten words)	Light face type 75c per line (ten words)
Bold face type $1.25 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.00 per line (eight words)

Allow nine words for keyed address. *Replies forwarded without charge*

SITUATIONS OPEN

EXCEPTIONAL OPPORTUNITY FOR GOOD RUBBER MAN IN Massachusetts factory near Boston making Rubber Tapes for the Government and supplies for essential civilian need. To relieve present executive and later take full charge. Post-war prospects excellent. Address Box No. 597, care of INDIA RUBBER WORLD.

CHEMIST-ASSISTANT CHIEF—OPENING IN MEDIUM-sized organization, either laboratory or plant. Tires and press goods. 100% defense with excellent post-war opportunity. Investigate if not now employed at your highest skill. All replies strictly confidential during all negotiations. Address Box No. 598, care of INDIA RUBBER WORLD.

PRODUCTION SUPERVISOR—TIRES, TUBES, mechanical goods. Opening for a high-grade director of plant activities. 100% defense with attractive post-war opportunity. Salary commensurate with ability. Address Box No. 599, care of INDIA RUBBER WORLD.

AN UNUSUAL OPPORTUNITY TO DO ORIGINAL research work is available for a Research Chemist or Chemical Engineer interested in securing a position with a manufacturer of essential materials located in the Metropolitan New York area. Applicant selected must be familiar with the technical aspects of tire construction and have a background of experience in the use of rubber dispersions and latex in tire cord saturating for crude and synthetic tires. State all particulars, including salary expected and draft status in first letter. Release required if now employed in essential industry. Address Box No. 601, care of INDIA RUBBER WORLD.

CHEMIST WITH RUBBER AND SYNTHETIC EXPERIENCE DEsired by eastern plant currently on war work. Splendid opportunity for both present and future. Please give full particulars. Address Box No. 602, care of INDIA RUBBER WORLD.

PLANT MANAGER

Because of death, a small but aggressive and successful New England rubber company requires a Plant Manager with chemical-engineering background, experienced in modern production methods. Should be thoroughly familiar with costs, compounding practice, new product development, both special and volume production. Age 40-50. Please give full details as to education, experience and salary you would consider. This is an unusual opportunity with a highly regarded, well established firm. Their personnel is aware of this advertisement.

Persons now in war work or essential activity not considered without statement of availability.

Placement fee will be paid by employer. Write or contact:

W. GAIL CAMP, Vice President
EXECUTIVE SERVICE CORPORATION (Agency)
19 WEST 44th STREET NEW YORK, N. Y.

SITUATIONS OPEN (Continued)

WANTED: RUBBER CHEMIST TO CONDUCT RESEARCH ON compounds in synthetic rubber and latex substitutes. Permanent position. Address Box No. 604, care of INDIA RUBBER WORLD.

SUPERVISOR OF OPERATIONS AT SEVERAL WAREHOUSES and plants with ability to install processing and handling equipment. Address Box No. 605, care of INDIA RUBBER WORLD.

RUBBER CHEMIST FOR WAR WORK, EXPERIENCED IN FOLlowing through from laboratory through all stages of production. State experience with molded rubber, hard and soft; sponge; neoprene and other synthetics. Write in detail age, experience, salary. Good future. Address Box No. 606, care of INDIA RUBBER WORLD.

SITUATION WANTED

ASSISTANT RUBBER CHEMIST JUST COMPLETED SYNTHETIC Rubber Course, start bottom, conscientious, licensed pharmacist, organic chemistry major. Address Box No. 603, care of INDIA RUBBER WORLD.

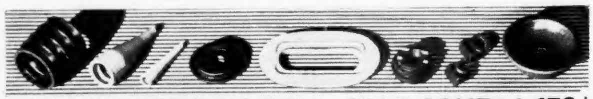
BUSINESS OPPORTUNITY

RUBBER FACTORY WANTED WITHIN 75 MILES New York City, either by purchase or lease. State particulars. Address Box No. 607, care of INDIA RUBBER WORLD.

MACHINERY AND SUPPLIES FOR SALE

FOR SALE: 3—30x60" HYD. RUBBER MOLDING PRESSES, COMplete with Hyd. Valves, top and bottom steam plates, single openings; 2 Presses 6"; 1 Press 12" Daylight Opening, 15" Rams, good for 2,000 lbs., hyd pressure. RODALE MFG. CO., Emmaus, Pa.

FOR SALE: 2—FOUR-ROLL WASHERS, 1—TWO-ROLL WASHER, 2—48" Mills, 2—42" Mills, 2 Crackers, 4 Allen 7" Strainers, 1—three-roll 54" Calender, 1—60" hot Doubling Calender, 1—60" and 1—72" Doubler, 10—200-gallon Churns, 4 Spreading Machines, 2 Hydraulic Presses, 6 Hydraulic Tire Vulcanizers, 1 cast iron jacketed Autoclave, 1 Hunter Drying Unit, 2—1,000 GPM Fire Pumps. Address Box No. 610, care of INDIA RUBBER WORLD.



SMALL RUBBER PARTS for WAR CONTRACTS
BLOWN · SOLID · SPONGE
FROM NATURAL, RECLAIMED, AND SYNTHETIC RUBBER
THE BARR RUBBER PRODUCTS COMPANY SANDUSKY OHIO

GRANULATED CORK
FOR EXTENDING RUBBER
SOUTHLAND IRON & METAL COMPANY
P. O. BOX 868 CORK DIVISION NORFOLK, VA.

FLEXO JOINTS

Reasonable in price — extremely low maintenance cost

FLEXO SUPPLY COMPANY, 1218 Olive Street, St. Louis

(Classified Advertisements Continued on Page 411)

MACHINERY AND SUPPLIES FOR SALE (Continued)

FOR SALE: 1—W. S. 15"x18" Hydraulic Press, 10" dia. ram; 2—D. & B. 20½x20½" platens; 1—14"x24" Press, 9" ram; 9—24"x55" Steel Cored Heating Platens; 1—26x66" 3-roll Calender; 1—Hydraulic Belt Press, 6'x30' with belt stretcher complete; 1—Farrel-Birmingham 15"x36" Rubber Mill; 4-W. & P. Mixers; Adamson 6" Tuber; Dry Mixers; Pulverizers; Grinders; etc. Send for complete list. CONSOLIDATED PRODUCTS CO., INC., 13-16 Park Row, New York, N. Y.

FOR SALE: 3—HYDRAULIC PRESSES; 7—CHANGE CAN MIXERS, 8 to 40 gals.; No. 20 Banbury Mixer; W. & P. Mixers, Lab. to 200 gal.; 6—Preforming Machines; 3—Vacuum Shelf Dryers. We buy your surplus equipment for cash. BRILL EQUIPMENT COMPANY, 183 Varick Street, New York City.

FOR SALE: 1—22x64—3-ROLL BIRMINGHAM COATING AND friction Calender with No. 3 Birmingham Herringbone reduction drive. 1—18x48—3-roll Birmingham Coating and Friction Calender with No. 1 Birmingham Herringbone reduction drive. Both units excellent condition. Address P. O. Box 852, La Crosse, Wisconsin.

1—FARREL 5-ROLL CALENDER, 68 x 24-INCH ROLLS, COMPLETE with motor. Details upon request. Address Box No. 608, care of INDIA RUBBER WORLD.

MACHINERY AND SUPPLIES WANTED

WANTED: ONE USED #3 ROYLE TUBING MACHINE. CROSS head preferred. State price, condition, serial number, and delivery. Address Box No. 600, care of INDIA RUBBER WORLD.

WANTED: 1—3-ROLL 24" OR 30" CALENDER, COMPLETE WITH Drive. KEATON RUBBER CO., 429 Adams St., Newark, N. J.

WANTED: BANBURY MIXER, MILLS, CALENDER, HYDRAULIC Presses, with pump and accumulator. Tubers. Any Condition. Address Box No. 609, care of INDIA RUBBER WORLD.

WANTED: 1—100 AND 1—150-GALLON JACKETED W. & P. MIXers. Also 1—#3 Banbury Mixer. Address Box No. 611, care of INDIA RUBBER WORLD.

WANTED: VULCANIZER; APPROX. 6'x15' to 24'. Address Box No. 612, care of INDIA RUBBER WORLD.

WANTED: RUBBER CUTTING MACHINE. ADDRESS BOX 175, Wakefield, Mass.

INDEX TO ADVERTISERS

This index is maintained for the convenience of our readers. It is not a part of the advertisers' contract, and India Rubber World assumes no responsibility to advertisers for its correctness.